

OF THE



MASSACHUSETTS AGRICULTURAL COLLEGE

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MASSACHUSETTS

FORESTRY PUBLICATIONS

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- Contents -

Rane - Brief instructions to Mass. forest wardens.

Rane - How and when to collect white pine seed.

Rane - Forestry from a commercial standpoint.

Clarke - Forest trees of Mass. How you may

know them: 1907 and ed. 3 1911.

Weed - The evergreens. Method of study in public school.



BRIEF INSTRUCTIONS

TO

MASSACHUSETTS

FOREST WARDENS



A valuable fifteen-year old stand destroyed by a ground fire. Mostly white pine.

BY

F. W. RANE, STATE FORESTER
Room 7, State House
BOSTON, MASS., U. S. A.

APPROVED FOR PUBLICATION
BY THE
STATE BOARD OF AGRICULTURE

INSTRUCTIONS

то

MASSACHUSETTS FOREST WARDENS

OREST WARDENS may be assured that their work is one of great economic and æsthetic importance to the future welfare of this Commonwealth. A forest warden understanding the object of his office and faithful to the honor bestowed upon him becomes a trusted public servant not only of his town, but of the state and nation.

Forest Fires

The prevention of forest fires is a very important part, one of the fundamentals in practical forestry.

Organization

following instructions: —

This cannot be done unless there is a well-organized force, in which the duties of each person are well defined and clearly understood. For this reason, careful attention should be paid to the

It is the duty of the forest wardens to see that their deputies are fully supplied with printed notices con-

taining forest fire laws. Early in the season, fire notices are sent to all wardens, but more can be obtained at any time from the State Forester. The forest wardens should see that these notices are properly posted in public places and along forest trails and locations frequented by fishing, hunting and camping parties.

During the dry seasons, which occur in the spring before the trees are in leaf, and in the fall, after the leaves have fallen, the forest wardens Caution in should keep sharp watch out for any dry times sign of fire, and everything should be kept in readiness so that no time will be lost in reaching the spot where smoke is seen or an outbreak reported. Fishermen, hunters and campers should be cautioned at every Hunters opportunity offered to be careful in the use of fire; to refrain from throwand ing lighted matches, pipe ashes, cigars campers and cigarettes on the ground, and espe-

cially to completely extinguish their camp fires before leaving them.

The forest wardens must use their own judgment as to how the work at a forest fire should be conducted, as it is assumed they have had Back ample experience in this line. Back firing should, however, be attempted only as a last resort, and even then the situation should be carefully examined and clearly understood.

It is important to remember that one hour's work in the early morning or late evening is worth six hours in the middle of the day in confires over trolling a forest fire. If a fire, therefore, night is not extinguished at evening the men should remain on the ground all night, and arrangements should be made for their comfort by the forest wardens. If a fire is left at night, much valuable time may be lost.

Especial pains should be taken to learn the cause of the fire, and the person or persons starting same.

Cause of questions as to the origin of the fire is "cause unknown." If the matter is attended to promptly there should be very little trouble in learning the point from which

the fire originated, and the cause. The facts, if obtainable, should be fully reported, regardless of whom they concern. If no definite facts can be obtained the forest warden is at liberty to give his opinion as to the origin.

In answering the printed questions in the report, the forest warden should furnish such further information as may relate directly or indirectly to the matter.

After a fire has occurred, the forest warden should immediately fill out and mail the report of the same to the State Forester, using the Reports printed form furnished for the purpose. An examination of the burned area should be made, however, so that the number of acres burned over, the extent and nature of the damage, and the amount and kinds of timber destroyed, may be approximately given.

Forest warden should read carefully the Massachusetts forest laws, which for convenience are published in a small booklet, and will be sent upon request, if you have not already received it.

Railroads

Hereafter, the forest warden will represent not only the town, but individuals in all dealings with the railroads relative to forest fires and their suppression.
(Chapter 431, section 2, Acts of 1907.)

In towns without definite facilities for combating forest fires, the forest warden should bring the matter before the town and emphasize

Equip- the importance of having some fire-extinguishers and other equipment in readiness. There are few towns but would adopt more modern methods, it is believed, if they had a well-defined practical plan placed before them.

Authority

No forest warden should hesitate in doing his full duty, as he has the laws of the State of Massachusetts back of him to carry out his work successfully.

II. Forest Management, Reforestation, etc.

The forest wardens shall investigate the values of forest lands, the character and extent of wood-cutting operations, the methods of reforestation and the prevalence of insect pests injurious to forest growth. 'He should be able to answer inquiries regarding seeds and seedlings of the various species, where they can be obtained, when and how to collect, and time and method of planting best adapted to the species. He should refer to the State Forester parties in his town desiring examinations and working plans of woodlots.

Especial care should be taken to note the presence of Gypsy and Brown-Tail moths and other insect outbreaks, and if discovered should report the same immediately, so that they may be combated before firmly established.

Any other matters which affect the extent and conditions of forestry, in general, in the respective towns, as over-taxation, etc., should be studied and reported upon as they come under the notice of the forest wardens.

As soon as the appointments of forest wardens have become sufficiently permanent to guarantee results, and the State Forester can Conprocure necessary funds to meet the expenses, arrangements will be ventions made to have an occasional convention of forest wardens, according to chapter 475, section 8, Acts of 1907. At such conventions, besides having discussions and lectures by strong forest experts on various subjects, each warden will have ample opportunity to compare his results and experience with those of others. Such conventions will tend to strengthen and make more effective the whole forestry environment in the State.

With a live central organization in the State Forester's office at the State House, alert to what is being accomplished by the forest service of the national government and other State organizations, and with

a corps of 320 forest wardens (one in each town), besides those in the cities, each with an organized working force of deputies, and a constantly growing public-spirited constituency of townsmen, we have splendid possibilities for accomplishing much in bettering our forestry conditions.

III. Conclusions to Forest Wardens

It may appear that the duties of the forest warden, as outlined, are numerous, of a broad nature and exacting, and they are to one who is attempting the work, if it is properly done. However, the whole subject of forestry is a new undertaking in this country, and the work in hand (1) to reclothe our waste and unsightly lands, (2) care properly for the forest growth already standing, (3) put a stop to wanton recklessness and great waste caused by forest fires, and (4) educate our people to thinking and doing in the light of forest economy, cannot be done in a day or year.

The State of Massachusetts does not expect impossibilities of you, and in outlining the above instructions and in formulating the forest laws passed by the recent General Court, the aim has been to devise ways and means whereby we may be able to accomplish ultimate results, in keeping with modern progress. Great economic good is to come from rational forestry methods, to say nothing of the æsthetic side, which likewise is worthy of our efforts.

That the forest warden has a definite field of usefulness in each town in Massachusetts, there can be no question, and that his work is one of great possibilities, I trust is made clear.

In behalf of the position which I hold as State Forester, I therefore extend to each warden, and through you to your deputies, a cordial invitation to consult my office at any and all times on forestry matters, and let it be generally known that the office is established by the State to accomplish great good for the whole State in general, and each town and individual in so far as practicable.

Yours very sincerely,

F. W. RANE, STATE FORESTER

Room 7, State House, Boston, Mass. Telephone 830 Haymarket





A thrifty young hardwood growth severely hurt by a ground fire.

While a ground fire does not kill all of the young hardwoods, as in the case of the white pine, it nevertheless dwarfs the trees and destroys far more value than is ordinarily realized.

The loss by fire of the forest floor, or spongy leaf mould, which renders ideal conditions of moisture, etc., for root development, is very damaging to good results.

We must protect and encourage these young and promising forest growths everywhere throughout the Commonwealth.

HOW AND WHEN TO COLLECT WHITE PINE SEED



This and next year's crop of cones. Large ones mature and ready for picking.

By F. W. RANE

Massachusetts State Forester

Room 7, State House

BOSTON, MASS., - - U. S. A.

1907



The Staminate (male) and Pistillate (female) flowers of the White Pine. These appear a year before the cones develop; hence it is an easy matter to determine a year in advance of a seed crop.

HOW AND WHEN TO COLLECT

WHITE PINE SEED

THE white pine (Pinus Strobus) is one of the most common trees found in Massachusetts and New England, and is of great economic and æsthetic value, yet the writer finds that little is known about its method of propagation.

Even teachers and those who have studied botany and nature study, and again farmers and men who have worked in the woods or at the lumber industry all their lives, seem never to have given the matter any thought or definite observation.

White pine is grown from seed only; it does not sprout from the roots when cut, as our hard woods. In replanting our waste and abandoned lands with white pine, the first step is to collect the seed. Some evidently think pine trees come from nothing, or were

created, perhaps, but this is not the way Nature does things. If we expect an agricultural crop, the kind of grain desired is planted; just so with growing the white pine.

Pine seed comes from the cones which grow upon the pine trees. The cones are

Seed comes from pine cones

more abundant upon trees of twenty years of age or more, and are located near the top of the tree. Old single pasture pines,

or those growing in clumps or along the edges of the forest, and more or less limbed, commonly called "cabbage pines," are usually the greater seed bearers. These trees, also, are the easier to collect the cones from.

It requires two seasons for the white pine cones to mature. The embryo cone, which

Two seasons for seeds to mature

is the pistillate (female) blossom of the pine, forms in the spring of the year, at which time it is fertilized, and can be seen throughout that whole season as a small, upright,

so-called "Christmas candle," an inch or so long. When vegetation starts the second season, however, the white pine cone takes on activity, and by August it reaches full size, which varies from four to six inches in length. During this time the seeds form at the base and under the scales. The cones remain green until the latter part of August or fore part of September, depending upon the nature of the season, when they mature and turn brown. When mature, the cones, while still hanging on the tree, open up (spread out their scales) at the first dry period, thus allowing the seeds which have been concealed to drop out. Each pine seed is provided with a delicate wing, in some respects resembling the wing

Seed scattered by wings of a bee, and this assists the seed very much in its distribution.

With scarcely any wind the seeds travel for some distance before they reach the ground, so with a strong gale at time of shedding, one can imagine how far they may be distributed. The finding of isolated pine seedlings is often accounted for in this way. The prevailing wind at time the cones are opening governs the territory seeded.

If we desire to collect white pine seed, it is important that the cones be collected before they open and lose their seed. This may be done in the latter part of the month of August, any time before the cones open.

There are various methods of collecting the cones, but the best advice is to get them somehow. Picking with a long ladder is one way; another, and one that will recommend itself, is to find out where lumbering is going on, and collect the cones as they fell the trees.

When connected with the New Hampshire College the writer tried a number of ways of solving this problem. One which worked very nicely was to send about four or five boys up the trees to pick the cones and throw them over the branches to the ground, while another one remained upon the ground and gathered them into bags. The cones may again be gathered by picking and putting directly in a bag which is attached to the shoulder, similar to the manner of picking apples. Old gluten or feed bags, inexpensive and commonly available about farmers' barns, answer very well for this purpose.

The number or quantity of cones that can be gathered in a day will vary as to the yield per tree, method of Mother gathering, etc. As white pine box-boards throughout New England are in great demand, and at a relatively high price, even the old "cabbage pines," full of limbs, a few years ago considered valueless, are at present rapidly going to the

sawmill. These old trees in the past have been the great seed producers and mother trees of our present forest stands. If they are destroyed, however, where must we look for our future pines?

One man, with two assistants, in a seed year spent nearly two days in cutting down

An
example
in collecting pine
seed

about 50 pine trees and picking the cones from them, and gathered two wagon loads, some 50 bushels before the cones were open.

When they were dried out and opened, he had fully 100 bushels of cones and nearly 5 bushels of uncleaned seed. His method of drying was to spread them out where the sun could shine on them, raking the pile over often, covering them with a canvas at night and in rainy weather. If the cones get wet they close up. It took in this case two weeks to get the seeds from the cones.



White pine cone with scales open and seed gone.
White pine needles grow in clusters of five.

After the cones are gathered it is not necessary that the seed be secured from them at once. They may be deposited in any dry place, where squirrels or mice are kept from them, and the seed thrashed out later. The practice of using a bag to put the cones in is convenient, for as they open up the bag can be flailed at odd times and the seed falls out into the bottom and is readily collected.

Should one have a greenhouse, it is usually available about the time the cones are ripe, and if they are placed here for a short time, avoiding any moisture for a few days, the high temperature will open the cones very quickly. The writer has made it a practice simply to place the bags in the greenhouse, and then turn and flail them occasionally, when the seed is easily separated. A hotbed or cold-frame sash could be made to serve the same purpose on a small scale.

There are probably many other ingenious ways of extracting the seed from the cones that will occur to different ones which will be equally good.

White pine seed has averaged in price in recent years from \$1.50 to \$4.50 a pound.

During the spring of 1907 the price in large quantities was \$3.75 a pound.

White pine seed if given normal conditions, not too moist or excessively dry, re-

tains its vitality for several years.

The reason that the seed has been so high is that the demand has increased very rapidly in this country lately, and the few dealers have

practically made their own prices.

It is hoped that this brief pamphlet will assist in calling attention to the importance of gathering white pine seed each year, when it is fruiting. We should ultimately consider the im-

portance of harvesting this crop, just the same as any other.

The writer would consider it a great benefit to New England, and Massachusetts in particular, if enough people could be interested so that a regular pine seed campaign could be kept up until the seeds of this most inportant forest tree could be purchased at 50 cents a pound, and it is believed it can be done.

With pine and other forest tree seeds in plenty, at reasonable prices, people generally will begin to start small nursery Beginnings beds in their gardens and fields, of which will in turn give us seedlings and transplants at a much more rational forestry basis than they can be obtained at present.

There are from 20,000 to 30,000 white pine seeds in a pound, and it is customary for nurserymen to plant this amount upon a bed

4 feet wide and 50 feet long. Under normal conditions, which will be described in

20-30,000 seeds in a pound a forthcoming circular, a person ought to raise 10,000 to 15,000 seedlings on this area. With the above data, and knowing the

distance apart that pines are set, usually 5 by 6 feet, one can figure out for himself the cost of growing his own stock of plants.

It has been the endeavor of the writer to tell in a precise and practical way just how

Reclothing waste ands

and when to collect the white pine seed. It now remains to be seen how many we can get to do something in this line. All per-

sons interested in reclothing our waste lands, and in establishing economic and æsthetic orestry conditions throughout this Commonwealth and New England, will find that practising and impressing the simple beginnings of forestry on others will go far toward an ultimate solution.

Expensive forestry seeds and seedlings that are the greatest drawbacks at the present in

time to beginning forestry work.

Reason for high

Let us remedy it. There are

few seedsmen who handle forest tree seeds, and the comparatively

little demand until now has made the business an uncertain one, and hence the prices are high.

If white pine sells for even \$2 a pound, no one cares to sow broadcast five pounds per acre, as is recommended by some seedsmen, as the expense makes the operation anything but practical. No one cares to use five or ten dollars' worth of seed on land that is in itself almost valueless. Collecting the seed one's self, however, obviates this difficulty and makes the conditions more favorable.

There is much inquiry as to how often white pine produces seed. Somehow the Seed year idea is quite firmly established in

the minds of many that a seed year once in seven is a fixed law. From observation there seems to be no definite regularity in Nature. A white pine, like other trees, if it yields a maximum crop one year, is not likely to produce another heavy crop in from three to seven, depending upon the seasons and other conditions. The writer has seen two heavy crops in one locality only four years apart. Examples are not uncommon, also, where a pine tree may be fruiting a fair number of cones and at the same time have embryo cones which are to fruit the following season.

Not all sections of the State are likely to seed the same year, although they may. By inquiry it is found that one section may have a heavy crop, while another may have none. In this way seed usually can be had from some section each year.

The seeds of spruce, hemlock, and other evergreens are collected in like manner as

Seed of the pine. Of course, they vary other in size of cone and seed and time of maturity.

Deciduous trees, or hard woods, are also easily grown from seed, and when one gets interested in collecting and growHardwoods ing the white pine, it is only a step toward later interest and pleasure in the whole forestry question.

We need to cultivate as a people a great love for out-of-door life, and there is nothing that awakens interest and a love for Nature herself more than the forests and their associations.

At a later time a companion booklet on methods of planting and caring for seedlings will be issued.

F. W. RANE,

State Forester

State House, Boston, Mass., August 1, 1907





FORESTRY

From a Commercial Standpoint



Address delivered by F. W. Rane, Massachusetts State Forester, before the Massachusetts Horticulture Society, February Twenty-three, Nineteen Hundred and Seven





FOREWORD

The writer has been unable to supply the requests that have come in for this address, hence it is issued herewith from the State Forester's office for general distribution to Massachusetts citizens



FORESTRY

FROM A COMMERCIAL STANDPOINT

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BY F. W. RANE, STATE FORESTER OF MASSACHUSETTS



HERE are few if any problems of greater moment and more economic importance to the State of Massachusetts at the present hour than that of forestry. Doubtless there are those present who have known this forest patient when she was healthy, vigor-

ous and strong; how beautiful primeval forests dotted this good old Bay State in those days and how, year by year, they have succumbed to our mad rush of uneconomic commercialism, until today finds us in a sadly depleted and unrational condition, viewed from the standpoint of modern forest management. It is always easy to point out mistakes after they have happened; but experience, though a dear teacher, is nevertheless extremely effective. Year by year the primeval forest growth was cut and harvested. Second growth, inferior but valuable, has followed, where conditions have been favorable, and this has, in turn, been utilized as soon as it reached merchantable size. Demand for forest products has been increasing in greater and greater proportion as we have been developing the State and nation, while the products themselves have likewise been approaching exhaustion. Our people have looked upon the forest products as inexhaustible, thinking naturally that, though Massachusetts should be depleted, there are plenty of other States at our very doors with indefinite supplies. Many of our country-loving and far-sighted citizens have time and again in the past predicted our present calamity; but the commercial era has absorbed us, and the successful business man of America has been the admired of admirers. Æsthetics in a new country are as nothing compared with commercial activities, when the bases of the commodities dealt in are free gifts and cost only for the marketing. The balance finally comes with the nation's development.

From the substantial old-time sawmill, — formerly so common upon our streams, now only relics of bygone days, — our evolution has developed to the portable mill. Instead of taking the logs to the mill, we now take the mill to the logs. While it is easy to comprehend this change of milling operations and the economy therein, the effect upon forestry itself and the country community has changed most remarkably. When logs were taken to the mills, most farmers employed their teams and labor during the winter months in getting out lumber for home consumption, but sold enough to make the effort and time profit-The old-fashioned method, too, of not cutting clean but taking only the larger and mature trees, did not destroy the forest, for replacement followed rapidly. Our present method is to sell the stumpage; and, as the purchaser finds he is able to market every vestige of the product, the forest area is stripped of vegetation. In earlier days this extreme of clearing was done only when the land was to be used for agricultural purposes. Where the larger growth only was taken out in the past, in twenty years or so the same land could be cut over

again at a profit; under the present practice it will require a period of nearly or quite twice as long for similar results. Again, even the cutting clear practice was not so productive of ill results until it came into such common use. When only here and there a tract was cut, the surrounding growth reseeded it; to-day the reseeding factor, also, is cut, leaving great areas where Nature is unable to assist as formerly. The white pine, for example, will re-establish itself whenever the conditions are favorable. When, as in earlier times, the ill-shaped and limbed specimens contained no commercial value, they were allowed to remain standing. These trees make our best seed trees, hence were responsible for reforesting the land with this species. To-day even these seed trees have value. No matter how pronged or crooked, they will make box-boards, pails, tubs, matches, etc., and bring prices of from \$14 to \$16 a thousand, when delivered. The results of this practice are, as we find them, altogether too common. Portable mills are operating at the present on wood lots that in earlier times could not be used commercially. Where the diameters of trees were thought of in terms of feet, we have simply changed the feet to inches for present practical usage. The commercial pine tree of to-day hardly reaches the seed-producing age before it is harvested.

What is true of white pine is equally true of many other of our forest trees. Our pulp companies chew up practically everything of the spruce and even balsam fir, which a few years ago was considered practically worthless, but which at present is of equal value in limited amounts. Hemlock was little thought of for joists and gen-

eral framing material in buildings not long since, but our carpenters now are not so particular. The American larch, commonly called tamarack or hackmatack, found growing in low, moist situations, was valueless until railroad ties and telegraph poles grew scarce; and then they found immediate value, now having largely disappeared. Hickory, commonly called walnut in New England, was the only wood thought suitable for tools, axhandles, whiffle-trees, etc.; but go to the market and see what are being substituted in its place. Of course our tools do not last as long as formerly. Were there time, it could be shown that each and every kind of wood has special qualities that adapt it for specific usefulness. The more we advance in commerce, industries and manufactures, we continue to discover new economic uses for all of our raw materials and products. There is not a species of wood grown at present but has a recognized standard of value. The time has come when simply the growing of cordwood in most sections of Massachusetts is a promising crop. Particularly is this true where the burning of brick is an important industry.

We, as a Commonwealth, are at an extremely interesting stage at the present time as regards our forestry problem. It is not only true of Massachusetts, but of New England and, for that matter, the whole country, to a greater or less extent.

As long as the prices of forest products remained low, we laughed at the idea of forest depletion. Experience is a wise teacher; and although the histories of older countries point out very clearly the mistakes they have made, their errors are seldom heeded in a new country until many of the same experiences have resulted.

When our forefathers came to these shores, New England was a vast wilderness, a primeval forest. We are told of the magnificent forests, and how individual trees reached great proportions throughout this whole section. Even the decaying stumps still extant remind us that but vesterday, in point of time, these monarchs of the forest which had been growing for centuries were with us. To-morrow a forest tree producing over a thousand feet board measure will be a veritable curiosity. We country-loving and public-spirited people are extremely anxious that the nation reserve certain portions of the White Mountains and the southern Appalachian range, that coming generations may enjoy, take pride in and benefit therefrom. A birthright for them as small as this is a pittance compared with the vast and almost endless expanse of virgin forest areas that was ours.

Viewing the subject as a whole, therefore, we must recognize that the time is ripe for action and public concern. To accomplish results, much thoughtful study and definite systematic planning must be done, in order that there will be no obstructions in the way. Education and example are our tools to work with.

"Forestry is the science and art of forming and cultivating forests; the management of growing timber." Forestry, therefore, as the title of my address indicates, is concerned with the economic production of merchantable wood and timber. Forestry should rightfully be thought of as a commercial industry. The forest products of a country should be one of her greatest assets, just as much as that of any other crop, agriculturally speaking, and even more to be relied upon than

our income from mining; for, with proper management, the investment will be permanent, inexhaustible, and hence fundamental to the nation's life and prosperity.

Lumbering is as important to successful forestry as is the digging of potatoes or the harvesting of any crop when it is ripe. The same essentials of culture, also, must be understood in getting maximum returns in the one case as in the other.

Forestry and commercial forestry are synonymous terms. Forestry in its true sense, when managed properly, will utilize our three million acres of land in Massachusetts, — at present seen scattered in every section, known as waste land, abandoned pastures, sprout lands, barrens, plains, etc.,—returning them to forest culture. The same culture that will return saw logs to our mills, make work for our country folk in winter, replenish our town treasuries, repaint the old red schoolhouse, pay the sexton to again ring the church bell, make better roads and, in short, return the former substantial livelihood of country life, will also conserve moisture, protect and enrich the soil, give an equable climate and return to Massachusetts and New England the natural beauty we all would love so much to see.

If commercial forestry will do this, the æsthetic man, who now and then sets out a shade tree and spends more time criticising the practical lumberman, can employ his time to better advantage.

Our portable mill operators, who are to be found in nearly every country town, are, generally speaking, our best and most public-spirited citizens and, as a matter of fact, the leaders of the communities. These men also are the most approachable men in the world, and willing to foster and

further every reasonable and commendable project. These men, I am confident, will be the men of the future, to be relied upon to do things in forestry. The fact that forest products are valuable and likely to increase rather than diminish,—it being an easy matter to demonstrate, even at present prices, that reforestation and better forestry management will pay,—gives life and interest to the undertaking.

Go into any rural section, or city, for that matter, in Massachusetts to-day and discuss modern forestry intelligently, beginning with the collecting of the seed, time of year to gather them, when to plant, how to care for the seedling, distance apart to set for results, when to thin and whether to prune, number of years to maturity, the kind of soils for different species, probable returns upon the investment, etc., and there is little trouble in interesting our people.

For the rest of my time to-day I want to give some forestry data likely to be of interest. Any data given upon forestry is, generally speaking, only suggestive; but if the basis of estimating is also given, comparative adaptations can be made where conditions vary.

In giving the following estimates, I have taken precaution to be conservative. It is better, it is thought, to give the data as it really exists, although the picture may not be as attractive. The rate of interest, the price of land and the assessed valuation upon the increment growth are all variable and elastic factors for basing computations.

PROFITS FROM WOODLAND UNDER PRESENT CONDITIONS IN MASSACHUSETTS

Term of years, forty. Taxes and valuation, figured at 4 per cent, compound interest. Average price of woodland, free of growth, estimated at \$6 per acre. As the trees grow, an addition of \$5 per acre every ten years is allowed, as follows:—

First ten years,.					\$6 00
Second ten years,		•	•		11 00
Third ten years,	•		•		16 00
Fourth ten years,		•			21 00

The average tax rate throughout the State is \$17 per thousand.

Second growth white pine, chestnut and sprout hardwood growth are those we are most familiar with.

(1) SPROUT HARDWOOD GROWTH

In sprout hardwood growth it is generally considered that a cord per year can be obtained in average conditions on an acre. Therefore, forty years equals forty cords; stumpage value, \$50 to \$80, depending on locality and proximity to market.

INVESTMENT AT END OF FORTY YEARS Compound interest of valuation, \$6, for forty years, \$22, 81

				2 2		
Taxes, with inte	rest:-	_				
First ten years,				\$3 97		
Second ten years,			•	4 48	1	
Third ten years,			•	4 83		
Fourth ten years,				4 29		
					17	57
Total cost,					\$40	38

Profit, \$10 to \$40 in forty years per acre, or 25 cents to \$1 an acre per year.

(2) CHESTNUT GROWTH

Can expect about 100 good telephone poles or 300 ties with 15 cords of wood, total net approximate value of \$100. Investment at end of forty years, same as for sprout hardwood growth, \$40. This leaves a net profit of \$60 per acre in forty years, or \$1.50 a year per acre average.

(3) SECOND GROWTH WHITE PINE (NATURAL REPRODUCTION)

From actual measurements, this growth was found to yield on an acre 25 cords of white pine and 15 cords of hardwood. White pine is worth \$5 per cord net for lumber, and hardwood for cord wood 1. Total, 40 cords, equals \$140. Deducting \$40, the investment, which is the same as for sprout hardwood growth and chestnut, leaves a net return of \$100 an acre in forty years, or a net income of \$2.50 a year per acre.

(4) NATURAL PASTURES (SO CALLED)

There are in Massachusetts over 1,000,000 acres of pasture lands. Assuming that all cattle and sheep are pastured at the average rental, statistics show that these lands do not average \$1.50 a year per acre. If from this sum we subtract \$1 a year, the amount allowed for taxes on valuation and compound interest on valuation, the same amount as allowed in the case of forestry lands, the net income for an acre per year is only 50 cents. This shows that there are thousands of acres of pasture lands in Massachusetts that rightfully and economically should be turned over to forestry.

Time was when this State was a great producer of grazing animals that were raised at a profit. Conditions now are greatly changed; and if we have learned anything in scientific agriculture in recent times, it is that concentration on smaller areas and a more definite rotation of crops make the successful farmer. This same logic and philosophy turn over acres upon acres of lands of our farms, at present in an unproductive and unprofitable stage, to an industry with not only great possibilities commercially, but improving a condition at present greatly needed.

(5) WHITE PINE PLANTED (NURSERY STOCK)

White pine seedlings, set 6 x 6 feet, require 1,210 per acre. Two-year seedlings are worth \$5 per 1,000.

Compound interest	t on	valua	tion,	\$11,	for fo	orty		
years, .		•					\$41	81
Compound interest	, 1,2	10 see	dlings	, at				
\$5,			•	•	\$6	05		
Compound inter	e s t	, trans	splant	ing				
1,210 seedlings,		•		•	4	95		
								
Total, .		•	•		\$11	00		
\$11 at interest for	forty	years	, .	•	•		52	80
Taxes, with inte	rest :	:						
First ten years,		•	•		\$6	63		
Second ten years,					7	15		
Third ten years,			•		6	34		
Fourth ten years,			•		6	33		
						—	26	45
Total cost,				•		•	\$121	06

Product at end of forty years, 40,000 B. M. feet, at \$5, equals \$200, leaving a net profit of \$78.94, or \$1.97 a year per acre.

These figures are based upon the maximum

cost of seedlings and planting, also the valuation of pasture land at \$11, instead of waste lands, as considered under (1), (2) and (3), at \$6.

(6) WHITE PINE PLANTED (HOME GROWN OR NATIVE SEEDLINGS)

Compound interest on valuation, \$6, f	ars,	\$22	81		
Initial outlay for seedlings and planting	g, \$5	per a	cre,		
plus interest for 40 years, .	•		•	29	00
Taxes, with interest, forty years,		•		17	57
				\$59	38

Returns at end of forty years, 40,000 B. M. feet, at \$5, equals \$200. Subtracting cost, \$69.38, leaves the net profits in forty years \$130.62, or an average of \$3.26 a year per acre.

Reducing the whole to tabular form, we have the following:—

1. Under favorable natural conditions of reforestation; returns per acre in forty years and average an acre each year:—

	Per Acre	Aver. an Acre
Growth:—	in Forty Years.	Each Year.
Hardwood,	. \$0 00 to \$40 00	\$0 00 to \$1 00
Chestnut,	. 60 00	1 50
Second growth white pine,	. 100 00	2 50
From pasture land, valuation	on \$11, average \$0.50	an acre per year.

2. Where trees are planted; returns per acre in forty years and average return an acre each year:—

White pine:	Per Acre in Forty Years.	Aver. an Acre Each Year.
Valuation, \$11.		
Seedlings, planting, \$11 + .	. \$70 00	\$1 75
Valuation, \$6.		
Seedlings, planting, \$5,	. 130 62	3 26

From these calculations it is shown that, even under present conditions, forestry can be practised

commercially with a reasonable profit. As a long time investment the returns must be considered as offering exceptional opportunities. The rate of interest under each example cited, per year, for the principal first used, at the end of the forty year period, is in each case as follows:—

					Pe	r Cent.
(1),					. 0	to 16
(2),					•	25
(3),		•		•	•	41
(4),		•		•	•	4
(5),	•	•			•	9
(6),						29

No matter how attractive we may make it, the fact still remains that few people are willing to make long time investments and wait for their fruition. The time is coming, however, when farsighted business men will recognize this source of investment as a safe and profitable one. The State of Massachusetts, it is believed, can well afford to make a beginning in this direction by purchasing at low cost much of our cheap lands and restocking them as forest reserves. Not only can they be made a valuable asset in the future to the Commonwealth, but to serve as examples of forestry methods.

Forest fires are a great menace to practising modern forestry in Massachusetts and are undoubtedly one of the greatest drawbacks to forestry undertakings. Our present laws regulating this problem are not effective enough. We have bills before the present General Court of Massachusetts looking toward an improvement in this direction. [Has become a law.]

The laws relative to the taxation of forest lands are in no way systematized or deduced to secur-

ing the best results. It is to be hoped that some simple, practical and expedient forest taxation laws may be formulated at an early time.

The greatest of all needs, however, — and we must come back to it as the foundation upon which our whole forestry structure must stand for success, — is a well-defined educational system, by which our people may be taught not only to recognize the importance of forestry, but how to get best results from a practical knowledge of the theory and practice combined.

In conclusion, I would say, let us be wise and The Massachusetts and New England of the future will be what you and I make it. History repeats itself. In the Old World the rise and fall of the Roman Empire had its associations with commercial forestry. Spain, — once the country of equable climatic conditions and beautiful meadows, the native country of the merino sheep and a progressive and prosperous agriculture, - has cut down her forests, denuded her mountains; and what is her present condition? We are told that in Biblical times certain valleys in Palestine were so fertile that they sustained and nourished great flocks and herds. Figuratively speaking, these valleys flowed with milk and honey. In those days the cedar of Lebanon and other forest trees were found in all their glory. What sort of a country is Palestine to-day? Travellers tell us it is dangerous to travel without a guide; the country is parched, dry and desolate.

What do we propose for the future of this nation or, for that matter, Massachusetts? If we are public-spirited, as I believe we are, and have a love for our country and Commonwealth,

we will awake to our responsibility ere it is too late.

Instead of following the example of countries like those mentioned, let us emulate the example of Germany, where modern forestry is practised successfully. Then, and only then, can we feel proud in believing we have done our full duty toward the forest interests of our native land.













HOW YOU MAY KNOW THEM



A POCKET MANUAL

By D. A. Clarke, under the direction of F. W. Rane, State Forester, State House, Boston, Mass., U. S. A.

1904

CONTENTS

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Pine Trees. Key for identifying.	PAGE 5	Beech Tree
White Pine Tree	. 6	Chestnut
Red Pine or Norway	. 8	Oak Trees. Key for identifying 32
Pitch Pine	. 9	White Oak
Tamarack or Larch	. 10	Chestnut Oak
Spruce Trees. Key for identifying	. 11	Swamp White Oak
Black Spruce	. 12	Red Oak
Red Spruce	. 13	Scarlet Oak 42
Hemlock	. 14	Yellow or Black Oak 43
White Cedar	. 15	Elm Tree. Key for identifying 45
Red Cedar or Juniper	. 16	Slippery Elm 46
Walnut Trees. Key for identifying	. 17	White or American Elm 47
Butternut	. 18	Hockberry 48
Black Walnut	. 19	Sassafras Tree
Hickory Trees. Key for identifying	. 20	Sycamore or Buttonwood Tree 50
Bitternut Hickory	. 21	Wild Red Cherry 5
Shagbark Hickory	. 22	Black Cherry
Mockernut Hickory	. 23	Locust Tree
Pignut Hickory	. 24	Maple Trees. Key for identifying . 55
Poplar Trees. Key for identifying	. 25	Striped Maple
Aspen (American)	. 2 6	Sugar or Rock Maple 57
Aspen (Largetooth)	. 27	Silver or Soft Maple 58
Birch Trees. Key for identifying	. 28	Red Maple
White or Gray Birch	. 29	Basswood or Linden Tree 60
Paper or White Birch	. 30	Black Gum or Tupelo 61
Yellow Birch	. 31	Ash Trees. Key for identifying 62
Sweet or Black Birch	. 32	Black Ash 63
Hornbeam or Ironwood	. 33	White Ash 64
Blue Reech	. 34	Red Ash 66

THE COMMERCIAL

FOREST TREES

OF MASSACHUSETTS

HOW YOU MAY KNOW THEM



A POCKET MANUAL

By D. A. Clarke, under the direction of F. W. Rane, State Forester, State House, Boston, Mass., U. S. A.



BOSTON: WRIGHT & POTTER PRINTING COMPANY, STATE PRINTERS, EIGHTEEN POST OFFICE SQUARE, NINETEEN HUNDRED AND SEVEN





APPROVED
BY THE STATE BOARD OF PUBLICATION



是有人的一种,但是不是**是我们的人的。他们的**

PURPOSE OF THIS HANDBOOK

THIS handbook has been planned and published by the State Forester in order to have a practical working description of the commercial trees at the command of Massachusetts citizens.

Technical terms necessarily used in botanical and forestry books are bewildering to the practical, everyday lumberman, farmer or average person. The attempt, therefore, of this treatise is to point out clearly how one can tell the commercially valuable trees of Massachusetts in a plain and untechnical manner.

The really most important points or characters the tree has, which distinguish it from all others, are first pointed out. This will be all many persons may care to know. If five needles growing in a cluster always denote a white pine, for example, and people have their attention called to it, few will ever mistake that tree for others. They can settle the matter easily by examining the tree for themselves. Likewise, other trees can be told by following the same plan of identification.

Acknowledgments

Mr. Daniel A. Clarke, a Harvard instructor and man of recognized experience and ability in forest botany, was selected to prepare this manuscript. The individual characteristics for identifying each species are Mr. Clarke's arrangement.

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The cuts illustrating the foliage and seed production were kindly loaned the State Forester by Director J. L. Hills of the Vermont Experiment Station. These cuts were used to illustrate a bulletin on "The Trees of Vermont," prepared under the direction of Prof. L. R. Jones of the University of Vermont.

The cuts illustrating the winter twigs and buds are from originals made by Miss Helen B. Mason, from carefully-selected specimens collected by Mr. Clarke.

Six cuts, credited under each, are from Sargent's "Manual of the Trees of North America," by permission of Houghton, Mifflin & Co.



It is hoped this handbook will be a source of inspiration toward assisting people, generally, in knowing our trees.

When we shall have created in our people, from youth up, a natural inborn love for Nature, the fundamentals of practical forestry will solve themselves as naturally as water flows down hill. Meanwhile, we have a pleasant task in bringing these conditions about. The more one knows about trees, the more he wants to know; and the natural outcome will be both better economic and æsthetic conditions.

This handbook is offered by the State, free of charge, believing that the persons possessing it will find it a useful and helpful companion.

F. W. RANE, State Forester

PINES

How to know the Pines

White Pine

(Pinus strobus L.)

Leaves

Arranged in 5-leaved clusters. Slender, flexible, bluish-green and 3 to 5 inches long.

Red Pine

(Pinus resinosa Ait.)

Leaves

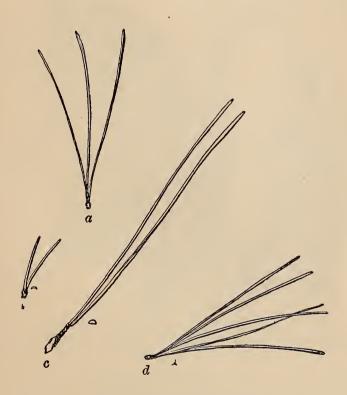
Arranged in 2-leaved clusters. Flexible, dark green and 5 to 6 inches long.

Pitch Pine

(Pinus rigida Mill.)

Leaves

Arranged in 3-leaved clusters. Stiff, dark yellowgreen and 3 to 5 inches long.



PINE LEAF CLUSTERS

a, Pitch; c, Red; d, White. All one-half natural size.

Note. — The Austrian and Scotch Pines are sometimes planted in Massachusetts. Both are introduced or imported. The Scotch Pine has two leaves in a cluster, two to four inches long, flat and of a bluish-white hue. The Austrian has dark green, slender, rigid leaves, two in a cluster, four to six inches long.

WHITE PINE (Pinus strobus L.)

THE White Pine is abundantly distributed throughout the State. It occurs on fertile soil, in moist situations, or on uplands.

When standing in the open, the young tree has a symmetrical, pyramidal outline. In the forest, its trunk is usually without branches for a considerable distance and the head is narrow. In old age the tree becomes



WHITE PINE CONE

With scales open and seeds gone. White Pine needles grow in clusters of five.

very irregular and picturesque. The trunk is continuous, gradually tapering, commonly from fifty to seventy feet in height and one to two feet in diameter. The branches are usually in whorls of five and extend horizontally.

The bark on young stems is thin, green tinged with red. On the old trunk it is thick and almost black, and divided by shallow fissures into broad, flat ridges.

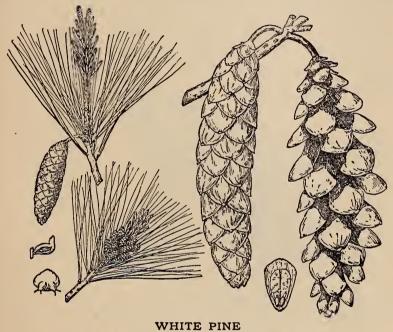
The leaves are arranged in clusters of five. They are

White Pine — Concluded

from three to five inches in length, bluish-green on the upper surface and whitish on the under.

The cone is cylindrical and from four to six inches in length. The seeds are small and winged. The cones open early in September of their second season.

The wood is very useful. It is light in color, light in weight, durable, except when in contact with the soil, and not easily warped by the sun. It supplies



Embryo and Mature cones. One-half natural size.

From Sargent's "Manual of the Trees of North America," by permission of Houghton, Mifflin & Co.

boards of good size, free from knots and of light weight. It is sawed into lumber, shingles and laths. It is used in cabinet-making, for interior finishing and for masts. In this State it is very largely worked into "box-boards" for the making of boxes. Then, in addition to serving so well these various utilitarian ends, it is a rapid-growing tree, increasing in height on the average at least a foot each year. So, all in all, the White Pine is one of the most valuable trees in the State and most deserving of being grown for forestry purposes.*

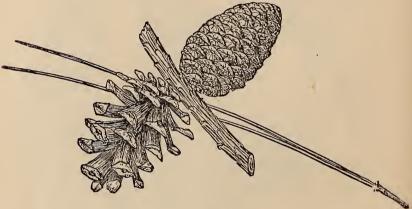
^{*} Send to the State Forester for a pamphlet, "How and When to collect White Pine Seed."

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RED PINE (Norway Pine) (Pinus resinosa Ait.)

N Massachusetts the Red Pine — appropriately so called both on account of the pale red color of the heart-wood and the distinctly reddish cast of the bark — occurs only locally and then chiefly in the northern and western sections. Usually it grows on light and somewhat dry soils.

When young it has an attractive conical outline; in old age it becomes somewhat irregular. It usually attains a height of fifty to seventy-five feet and has a continuous trunk, two to three feet in diameter. The branches are stout, usually extend horizontally and clothe the trunk quite or nearly to the ground.



RED PINE .- One-half natural size.

From Sargent's "Manual of the Trees of North America," by permission of Houghton, Mifflin & Co.

The bark is light red-brown in color and divided by shallow fissures into broad, flat ridges.

The leaves are in clusters of two, flexible, dark green and five to six inches long. They remain on the tree for four or five years.

The cones are egg-shaped, two to three inches long and mature in the fall of their second season.

The wood is light, strong, hard and pale red in color. It is used in construction, for building, and to a certain extent for masts.

The name Norway Pine has so little fitness as applied to this tree, and is so evidently misleading that its use is to be discouraged.

The Latin name suggests a resinous wood, but in fact it is less so than either of the other Pines.

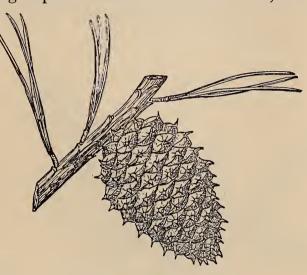
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PITCH PINE (Pinus rigida Mill.)

THE Pitch Pine grows in poor, sandy and gravelly soil in all parts of the State, often forming a considerable tract of almost pure growth, as in the southeastern sections near the coast.

In habit it is usually a low tree with irregular and variable outline. Normally, the height is from thirty to forty feet and the diameter from one to two feet. The trunk is continuous, straight and tapers rapidly. The branches, grouped in threes about the trunk, are

thick and often contorted. The bark o n young stems and branches is rough. On old trees it is deep gray or reddishbrown, and irregularly divided into broad, flat, ridges. The



broad, flat, PITCH PINE.—One-half natural size.

continuous

by permission of Houghton, Mifflin & Co.

leaves are in clusters of three. They are three to five inches long, stiff, dark yellow-green and fall during their second year.

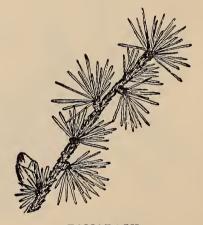
The cones are one to three inches long and light brown in color. They often remain on the tree for ten or twelve years. The scales are tipped with sharp prickles,—a character likely to aid in the recognition of the species.

The wood is light, soft and brittle. It is sometimes sawed into coarse lumber and is used for charcoal and for fuel. It is chiefly valuable because it will do well on extremely sterile soil, although it is a slow grower. Turpentine and tar were once made from this species in New England. There is a growing tendency to use this species for box-board lumber.

TAMARACK (Hacmatack, Larch) (Larix laricina Koch)

PREFERRING cool, swampy situations, though often growing on uplands, it occurs in most parts of the State, more commonly in the northern sections than elsewhere.

In habit it is a tall tree with regular and narrow pyramidal outline. Ultimately it acquires a height of fifty to sixty feet and a diameter of eighteen to twenty inches. The trunk is continuous and tapers rapidly. The branches are slender and horizontal or slightly ascending.



TAMARACK

Branchlet and cone. One-half natural size.

The leaves are borne in clusters. They are linear in shape, from three-fourths of an inch to one and a quarter inches in length and bright green in color. In the autumn before they fall they become yellow.

The cones are small, almost globular, nearly threequarters of an inch long and light brown in color. The seeds are small and winged.

The wood is close-grained, heavy, strong and durable. It is used in shipbuilding, and for posts and railroad ties.

While this species is found in moist places, it often does equally well when planted on upland.

SPRUCES

How to know the Spruces

-Black Spruce

(Picea mariana B. S. P.)

Leaves

Blue-green and not glossy.

Cone

One-half to one and a half inches in length. Usually remain on the tree for many years.

Red Spruce

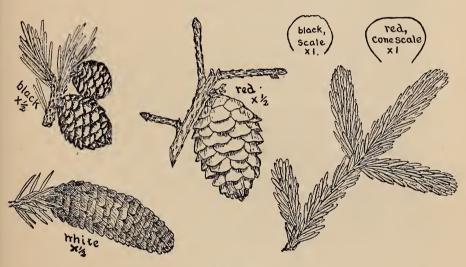
(Picea rubens Sarg.)

Leaves

Dark yellow-green and very glossy.

Cones

One to two inches in length. Usually fall during the first year.



SPRUCES

Branch, cones and cone-scales.

Note. — The Norway Spruce, so commonly planted as an ornamental tree and for hedges, is an introduced species. It has a large, slender cone, five to seven inches long, which easily distinguishes it from others. The branches are also more drooping or pendulous.

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BLACK SPRUCE (Picea mariana B. S. P.)

THE Black Spruce is a small and rather unimportant tree which is of frequent occurrence in the northern and western sections of the State. Usually it grows in swamps and on the borders of streams, though sometimes on uplands.

In habit it is a conical tree with a height of twenty to thirty feet and a diameter of six to twelve inches. The branches are short, horizontal or slightly declining and tend to turn upwards at the extremities, somewhat after the manner of the Norway Spruce.

The bark on the trunk is grayish-brown and broken into three scales.

The leaves are about one-half inch long and bluegreen in color.

The cones are egg-shaped, one-half to one and one-half inches in length and grayish-brown in color. They usually remain on the trees for several years and often persist for as many as twenty years.

The wood is light, soft and weak. It is seldom used here except for making paper pulp.

Black and Red Spruce have, until recently, been considered the same species, but under the new classification the Black Spruce now becomes a far less valuable tree, commercially, than the Red.



RED SPRUCE (Picea rubens Sarg.)

THIS Spruce is common in the western and northern parts of the State, almost always growing in the well-drained soil of uplands or mountain slopes.

As to habit, its outline is narrowly conical in youth and middle age, and frequently irregular and picturesque in old age. It is a medium-sized tree, commonly reaching a height of forty to fifty feet and acquiring a diameter of one to two feet. The trunk is straight and tapers very slowly. The branches are rather long, frequently slightly pendulous, clothe the stem nearly to the ground and persist for a long time.

The bark is red-brown and broken into irregular scales.

The leaves are about one-half inch in length, dark yellow-green and glossy.

The cones are oblong, one to two inches in length and reddish-brown.

The wood is light, soft and less durable than Pine when exposed to the action of the weather. It is largely used for building-timber and for clapboards and shingles. Owing to the fact that it imparts no flavor, spruce is used in the manufacture of buttertubs and boxes. Great quantities are consumed in the pulp mills.

This species, Professor L. R. Jones of Vermont says, was responsible for the suggestion of the name Green Mountain State to that Commonwealth.

It is not uncommon for lumbermen to designate this species as Black Spruce, but, as this is the only commercial Spruce of importance to Massachusetts, we should readily appropriate the right name, or Red Spruce.



HEMLOCK (Tsuga canadensis Carr.)

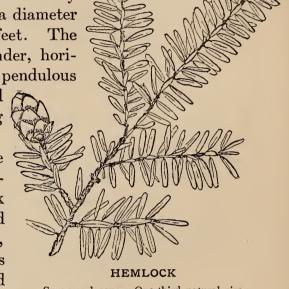
THE Hemlock is found in most parts of the State, though it is much more abundant in the western sections. It delights in the moist, cool shade of rocky ridges and river gorges.

In the open, it is a beautiful, pyramidal tree with branches extending quite or almost to the ground. In the forest, it has a tall, gently-tapering trunk which is

surrounded by a rather small, round head. As a rule, it attains a height of fifty or sixty feet and a diameter of two or three feet. The branches are slender, horizontal or slightly pendulous near the ends and persist for a long

The bark on the old trunk is cinnamon red or dark gray and divided into narrow, rounded ridges which are covered with scales.

time.



Spray and cone. One-third natural size.

The leaves are from one-third to two-thirds of an inch in length, oblong, dark green and lustrous on the upper surface and whitish beneath.

The cones are oblong, about three-fourths of an inch long and light brown in color. The seed is small and winged, maturing in the fall and shedding during the winter.

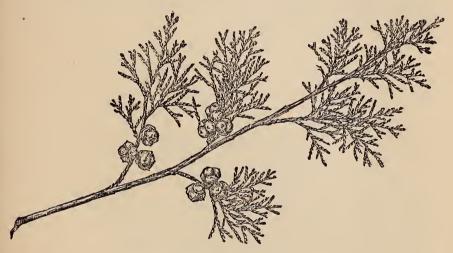
The wood is very light, soft and brittle. When exposed to the air it perishes quickly. It is sawed into coarse boards and used for cheap building material and sometimes for fuel. The bark is of value for tanning.

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WHITE CEDAR (Chamaecyparis thyoides B. S. P.)

THE White Cedar grows almost wholly in swamps, particularly those that are flooded for most of the year. In Massachusetts it occurs in patches of considerable area in the southeastern sections and to a limited extent in other parts.

As to habit, its slender, horizontal branches form a narrow, conical head of neat appearance. The trunk is continuous and attains a height of twenty to forty feet and a diameter of eight to fifteen inches.



WHITE CEDAR. - One-half natural size.

From Sargent's "Manual of the Trees of North America," by permission of Houghton, Mifflin & Co.

On the trunk the bark is reddish-brown and flakes off in thin scales. On old trees, particularly near the base, it is irregularly furrowed.

The leaves are scale-like, not over an eighth of an inch in length and dull blue-green in color.

The cones are roundish, about a half-inch in diameter and red-brown at maturity. The seed is small and winged.

The wood is light, soft, weak, very durable and aromatic. It is used for boat-building, interior finishing and for posts. For this last purpose it is particularly desirable.

RED CEDAR (Red Juniper) (Juniperus virginiana L.)

HIS tree receives its popular name, Red Cedar, from the red color of its heart-wood. Growing on dry and gravelly soil and sometimes on rather moist ground, it is common in the eastern sections of the State and of occasional occurrence in the central and western parts.

In habit it is variable. In youth its outline is normally conical, and in old age it is broad and round. The trunk is continuous and attains a height of twenty-five to thirty feet and a diameter of eight to fifteen inches.



RED CEDAR
Two-thirds natural size.

The bark on the trunk is light brown tinged with red. When the tree has acquired age it separates into long, narrow, ribbon-like flakes.

The typical leaves are scale-like, about a sixteenth of an inch in length and dark blue-green in color. On young trees and sometimes on the mature plants, there are needle-shaped leaves about one-half inch in length.

The fruit is berry-like, globular, about the size of a pea and dark blue.

The wood is light, close-grained, not strong, easily worked and durable. It is red in color and pleasantly aromatic. It is used for posts, for pails and in cabinet-making.

WALNUTS*

How to know the Walnuts

Butternut

(Juglans cinerea L.)

Habit

Low, wide-branching, with a broad, round-topped head.

Black Walnut

(Juglans nigra L.)

Habit

Tall, straight, destitute of branches for a considerable distance from the ground, with a narrow, round-topped head.

Bark on Trunk

Dark gray and divided into broad, flat ridges.

Bark on Trunk

Dark brown or almost black and deeply divided into rounded ridges which cross each other obliquely.

Leaves

Leaflets 11 to 17 in number.

Leaves

Leaflets 15 to 23 in number.

Fruit

Oblong, cylindrical and covered with sticky hairs.

Fruit

Globular, without sticky hairs, and somewhat rough.

The Black Walnut and Butternut are easily cultivated, being grown readily by planting the nuts where they are to remain. Seedlings can also be transplanted, but care must be exercised, as they have a pronounced tap-root. The Black Walnut makes a valuable forest tree, and both species make good shade trees and are also valuable for their nuts.



^{*} The true Walnuts. New England people use this name commonly for the Hickories. (See Hickories.)

BUTTERNUT (Juglans cinerea L.)

GROWING in rich, moist soil near streams and on low, rocky hills, the Butternut occurs throughout Massachusetts, though most abundantly in the eastern and central portions.

It is a low, broad-headed tree, usually rising to a height of thirty to forty feet with a trunk diameter of

one to four feet. It branches a few feet from the ground, sending out long, rather stout, horizontal limbs.

The bark on the trunk is dark gray and divided into broad, flat ridges. The leaves



BUTTERNUTLeaf and fruit. One-third natural size.

BUTTERNUT
Winter twig.
One-half
natural size.

are alternate, from fifteen to thirty inches long and have from eleven to seventeen leaflets. The nuts, which are borne in drooping clusters, are oblong-cylindrical in shape, about three inches long and covered with sticky hairs.

The wood is light, soft and weak. It is employed for the interior finish of houses and used in the manufacture of furniture.

BLACK WALNUT (Juglans nigra L.)

THE Black Walnut is rather rare in Massachusetts, though it occurs more frequently in the western

part of the State than in the eastern. When found, it is usually growing in rich bottomlands or on fertile hillsides.

It is a large tree of upright growth and narrow, round head, which normally attains a height of fifty to seventy-five feet and a trunk diameter of two to five feet. The branches are stout and rigid and the lower ones extend horizontally.

The bark on the trunk is blackish and deeply divided into rounded ridges which have a tendency to cross each other obliquely.

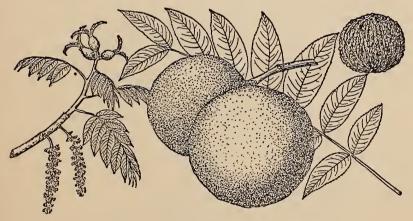
The leaves are alternate, from one to two feet long and have from fifteen to twenty-three leaflets.

The fruit is a globose nut, about two inches in diameter, with a slightly roughened surface.

The wood is heavy, hard, strong, durable and capable of taking a fine polish. It is very valuable for cabinet-making and the interior finish of houses. The older the tree, generally speaking, the darker and more valuable is the wood.



BLACK WALNUT Winter twig and buds. One-halfnatural size.



BLACK WALNUT. - One-half natural size.

From Sargent's "Manual of the Trees of North America," by permission of Houghton, Mifflin & Co.

HICKORIES

How to know the Hickories

Shagbark	· Mocker Nut	Pignut
(<i>Hicoria ovata</i> Britton)	(<i>Hicoria alba</i> Britton)	(<i>Hicoria glabra</i> Britton)
Bark on Trunk	Bark on Trunk	Bark on Trunk
Rougher than in other species. Light gray and separates into long, thick plates which are only slightly attached to the tree.	Dark gray, with numerous ridges and without flaking plates.	Dark gray. Comparatively smooth. Often broken into plates.
Leaves	Leaves	Leaves
Leaflets usually 5, rarely 7.	Leaflets 7 or 9 in number.	Leaflets 3, 5 or 7 in number.
Winter Buds	Winter Buds	Winter Buds
Terminal bud eggshaped. Outer scales are dark reddish-brown with long, narrow tips and persist until spring.	Terminal buds broadly egg-shaped. Outer scales are dark reddish-brown and fall in autumn. Inner scales light green.	Terminal buds elliptical. Outer scales are dark reddish-brown and usually fall in the autumn. Inner scales yellowgreen.
Twigs	Twigs	Twigs
Smooth or coated with soft hairs.	Stout and covered with a woolly growth.	Smooth.
Fruit	Fruit	Fruit
Husk thick and	Husk thick and	Husk usually thin.
* *	0	The shell either thick or thin and
the seams. Shell usually thick and the kernel sweet.	and the kernel small and sweet.	the kernel sweet or bitter.
	Britton) Bark on Trunk Rougher than in other species. Light gray and separates into long, thick plates which are only slightly attached to the tree. Leaves Leaflets usually 5, rarely 7. Winter Buds Terminal bud eggshaped. Outer scales are dark reddish-brown with long, narrow tips and persist until spring. Twigs Smooth or coated with soft hairs. Fruit Husk thick and deeply channeled at the seams. Shell usually thick and	(Hicoria ovata Britton) Bark on Trunk Rougher than in other species. Light gray and separates into long, thick plates which are only slightly attached to the tree. Leaves Leaflets usually 5, rarely 7. Winter Buds Terminal bud eggshaped. Outer scales are dark reddish-brown with long, narrow tips and persist until spring. Winter Buds Twigs Smooth or coated with soft hairs. Twigs Smooth or coated with soft hairs. Fruit Husk thick and deeply channeled at the seams. Shell usually thick and the kernel small



BITTERNUT (Hicoria minima Britton)

NHABITING wet woods near streams and sometimes hilly slopes, the Bitternut is common in most sections of Massachusetts.

Like most of the genus, its trunk tapers gradually to the point of branching and develops a tall cylindrical head with a breadth of twenty to thirty feet. Commonly it grows to a height of fifty feet and has a trunk diameter of one to two feet.

The bark on the trunk is granite-gray faintly tinged with yellow and less rough than in most of the species,

yet broken into thin, plate-like scales. The new growths are smooth and orange-green



BITTERNUT HICKORY
Leaf and fruit. One-third natural size.

BITTERNUT Winter twig. One-half

natural size.

in color. The winter buds are bright yellow, quite different from those of its relatives.

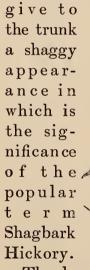
The leaves are alternate, compound, from six to ten inches long and composed of from seven to eleven leaflets. The individual leaflets are smaller and more slender than in the case of the other species. The fruit is about one inch long and thin-husked, while the nut is usually thin-shelled and brittle and the kernel very bitter. The wood is heavy, hard and strong. It is used in making hoops and ox-yokes and for fuel.

SHAGBARK (Hicoria ovata Britton)

GROWING in rich, deep soil near streams and on fertile hillsides, the Shagbark is of common occurrence throughout the State.

The tallest of the Hickories, it has the characteristic habit of the group, a tapering trunk destitute of branches for a considerable distance and a cylindrical head of relatively narrow spread. Usually it attains a height of fifty to seventy-five feet and a trunk diameter not exceeding two feet.

The bark on the trunk is light gray, separating into thick plates often a foot long. When these are only slightly attached, they



The leaves are alternate, compound, from eight to fifteen inches long and composed of five,

e t

SHAGBARK HICKORY
Leaf and young fruit. One-third
natural size,

SHAGBARK Winter twig. One-half size.

rarely seven leaflets. The fruit is borne singly or in pairs and is globular. The husk is deeply grooved at the seams. The kernel is sweet.

The wood is heavy, hard, tough and very strong. It is used largely in the manufacture of agricultural implements and in the building of carriages and wagons. For fuel it is the most satisfactory of our native trees. The nut is a valued article of commerce.

MOCKER NUT (Hicoria alba Britton)

THE Mocker Nut — probably so called because of the size of the nut and the smallness of the kernel

— is distributed throughout the State and is common in the eastern sections. It grows in various soils, on ridges, rocky slopes and in rich bottom-lands.

In habit it is very similar to the Shagbark. It is a tall tree, fifty to sixty feet in height and one to two and one-half feet in diameter.

The bark is dark gray, much like that of the Pignut, yet with much more numerous ridges and without the flaking The recent shoots are short, stout and more or less covered with a downy growth.

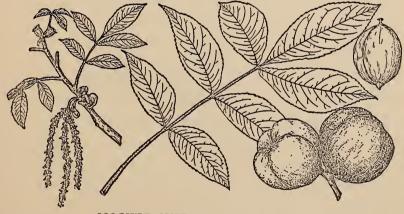
The leaves are alternate, compound, eight to ten inches in length and composed of seven to nine leaflets.

The fruit is borne singly or in twos and ripens in October. It is variable in size and shape. Usually it is globose and has a strong-scented husk. The nut is thickshelled and the kernel small and sweet.

The wood is heavy, hard, tough and strong. It serves for the same purposes as does that of the Shagbark and is only slightly inferior.



MOCKER NUT Winter twig. One-half natural



MOCKER NUT .- One-half natural size. From Sargent's "Manual of the Trees of North America," by permission of Houghton, Mifflin & Co.

PIGNUT (Hicoria glabra Britton)

THE Pignut is abundantly distributed throughout Massachusetts. It seems to prefer the dry ridges and hillsides and is usually in the company of other trees.

Naturally a tall tree, its height seldom exceeds fifty to sixty feet and its diameter is from one to two feet. It has a tapering trunk and a cylindrical head of relatively narrow spread. The bark on the trunk is dark gray.

On old trunks it is comparatively smooth, though often it is broken with plates, somewhat after the manner of the Shagbark.

The leaves are alternate, compound, eight to twelve inches long and composed of five to seven leaflets. The individual leaflets are rather small and narrow.



PIGNUT
Winter twig.
One-half natural size.

Leaf and fruit. One-third natural size.

The fruit, which ripens in October, is borne singly or in pairs and is very variable in shape. Sometimes it is pear-shaped, sometimes round; at other times it is egg-shaped. The fruit is usually small and the husk thin. The wood is heavy, hard, strong, tough and flexible. It is employed in the manufacture of wagons, agricultural implements and tool handles.

POPLARS

How to know the Poplars

Aspen (American)	Largetooth Aspen	
(Populus tremuloides Michx.)	(Populus grandidentata Michx.)	
Leaves	Leaves	
Roundish. Margin finely toothed. Upper surface lustrous.	Broadly egg-shaped. Margin coarsely scalloped. Upper surface not lustrous.	
Winter Buds	Winter Buds	
Conical, lustrous and somewhat sticky.	Broadly egg-shaped. Not sticky and covered with whitish, matted hairs.	
Bark	Bark	
Very bitter.	Not bitter.	

Note.—Introduced species.—In addition to these native Poplars, two European species are very commonly planted—the Lombardy Poplar (P. nigra Italica), recognized by its tall, spire-like form, and the White Poplar (P. alba), easily distinguished by its leaves, green above and very white-cottony beneath.

The Poplars belong to the Willow family and resemble the Willows, especially in flower and fruit characters. The nodding, worm-like, staminate and pistillate catkins are borne upon different trees and, opening before the leaves, are conspicuous in early spring. The Poplars are quite widely distributed, extending from the Arctic circle to Mexico and from the Atlantic to the Pacific.

The wood of Poplars is very soft and light and especially liable to warp, but is cheap and useful for making toys, boxes and smaller furniture. Much of it now goes to the pulp mills.

The Poplars, like the Willows, can be propagated easily from cuttings.

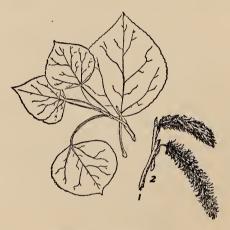


ASPEN (American) (Populus tremuloides Michx.)

HE Aspen is a rapid-growing tree common to all parts of Massachusetts, thriving in many soils and situations but preferring a moist, somewhat sandy soil. It is frequently the first tree to take possession where forests have been burned or cut off.

Here it is a small, graceful tree, seldom exceeding a height of thirty to forty feet and a diameter of eight to fifteen inches. The branches are slender, extend at right angles to the stem, are slightly pendulous toward the ends and form a narrow, round head.

The bark is smooth and pale green, marked with patches of dark brown. On the old trunk it is ashgray, although at the base of the tree it is almost



AMERICAN ASPEN

Leaves and flowers; 1 staminate, 2 pistillate. One-third natural size.

black and conspicuously ridged. The bark is very bitter and has a taste similar to that of quinine.

The leaves are simple, alternate, roundish, about two inches in length, finely toothed, and dark green and lustrous on the upper surface. The leaf stalk is flattened at right angles to the blade of the leaf.

The flowers are in catkins and appear in April before the leaves.

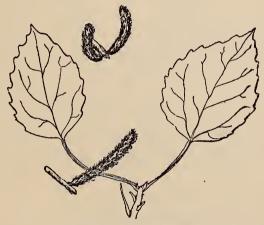
The wood is soft, weak and very perishable when exposed to the weather. It is of little value although it is used to a certain extent in the making of paper pulp, box-boards and occasionally for fuel.

LARGETOOTH ASPEN (Populus grandidenta Michx.)

THE Largetooth Aspen is of common occurrence throughout the State, growing in various soils and situations, but preferring rich, sandy soil in the vicinity of streams and swamps.

It is a quick-growing tree, very similar in habit to the Aspen. Naturally it attains a height of thirty to forty feet and a trunk diameter of twelve to twenty inches.

The bark is smooth and greenish-gray in color. On old trees it is somewhat darker and divided into broad, flat ridges.



LARGETOOTH ASPEN

Leaves and flowers; pistillate above, staminate below.

One-third natural size.

The leaves are simple, alternate, broadly egg-shaped, three to four inches in length, coarsely scalloped on the margins and dark green on the upper surface. The leaf stalk is flattened at right angles to the blade of the leaf.

The flowers are in catkins and appear in March or April, before the leaves.

The wood is similar to that of the preceding, being light, soft and of little value. It is used for paper pulp, box-boards and sometimes for fuel.

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BIRCHES

How to know the Birches

Gray Birch (Betula populifolia Marsh.)	Paper or White Birch (Betula papyrifera Marsh.)	Yellow Birch (Betula lutea Michx. f.)	Sweet or Black Birch (Betula lenta L.)
Bark Grayish-white and chalky on the outer surface and orange	Bark Creamy-white and lustrous on the outer surface and orange	Bark Silvery-gray or light orange in color. Separates	Bark Dark, almost black and without lustre. Broken into large,
on the inner. Does not separate into papery layers.	on the inner. Separates readily into thin layers.	into thin, persistent layers. On young branches aromatic.	irregular plates. On young branches aromatic.
Leaves	Leaves	Leaves	Leaves
Triangular, long- pointed and coarsely doubly toothed. Lustrous on upper surface.	Egg-shaped and not long-pointed. Usu- ally doubly toothed. Not lustrous.	Egg-shaped to oblong. Sharply doubly toothed.	Egg-shaped to oblong. Sharply toothed.
Flowers	Flowers	Flowers	Flowers
Winter catkins borne singly or in pairs.	Winter catkins borne in clusters of three.	Winter catkins not clustered. Three to four on a shoot.	Winter catkins not clustered. Three to four on a shoot.

Note. — The European White Birch (B. alba), an introduced species, is commonly planted for ornamental purposes. It is a beautiful tree, closely resembling the native White Birch. There are numerous horticultural varieties, some with finely-cut leaves and pendulous branches.

The wood of Birches is valued chiefly for cabinet-making, for spools and other small articles.

Birches yield quantities of seed and are extremely valuable in reseeding waste and barren lands, and rendering the conditions favorable to White Pine coming in. The White Pine then replaces them in clean stands.

When young, the saplings of all the species look more or less alike.



GRAY BIRCH (Betula populifolia Marsh.)

HE Gray Birch grows abundantly in all parts of the State, thriving on the poorest sandy soils, yet by no means limiting itself to such unfavorable situations. This is the tree that is usually the first to take possession of fields or pastures that have gone into disuse, mingling with other plants of similar desires

or taking possession of many areas by itself.

As commonly found, it is a small, slender, pyramidal tree, from twenty to twenty-five feet in height. The trunk

as a rule ascends obliquely. Branches are short. slender and often pendulous and clothe the trunk to theground.



The whole appearance of the tree is light and airy. The bark on the trunk is grayishwhite and chalky on the outer surface and orange on the inner. Unlike some of the other birches, its bark does not easily separate into layers. The branches are blackish and the young shoots are brown. The leaves are simple, alternate, triangular, GRAY BIRCH long-pointed, two and one-half to four inches in length, coarsely toothed and dark green and glossy on the upper surface.

The flowers are in catkins. The sterile ones appear in the fall and are usually solitary.

Winter twig and buds.

One-half natural size.

The wood is light, soft and not durable. It is used in the manufacture of spools and shoe pegs and is useful for summer fuel. The tree is chiefly valuable for the rapidity with which it grows on poor soil.

PAPER OR WHITE BIRCH (Betula papyrifera Marsh.)

N Massachusetts the Paper Birch, so called because of the use to which the early settlers put the bark, grows commonly in the middle and western parts of the State and is very infrequent in the eastern sections. Wherever found, its favorite home is the vicinity of

streams and swamps and the damp. wooded slopes.

In habit it is a pyramidal tree of graceful appearance, commonly attaining a height of about

WHITE OR PAPER BIRCH Leaves and fruit. One-third natural size.

The trunk is usually continuous, though it sometimes divide, and the slender branches are horizontal or slightly pendulous. When old or crowded, the Paper Birch loses its lower branches and assumes a small, round head. The bark on the trunk is white and lustrous on the outer surface and orange on the inner. It separates freely into thin, papery scales. The leaves are simple, alternate, egg-shaped, apex not long-pointed, OR PAPE three to four inches long, doubly toothed and Winter twig dark, lustreless green on the upper surface. The flowers are borne in catkins. The sterile

fifty feet and a diameter of one to two feet.

WHITE R PAPER

catkins which appear in the fall are mostly in clusters of three. The wood is light, strong and hard. It is used for spools, shoe lasts, pegs, in the making of paper pulp and for fuel.

YELLOW BIRCH (Betula lutea Michx. f.)

THIS Birch is common throughout Massachusetts, inhabiting the low, rich woods and hillsides or mountain slopes.

It is the largest of the native birches and often attains a height of fifty to sixty feet and a trunk

diameter of two to three feet. Usually the trunk divides at a considerable distance from the ground, continuing in two or three large limbs. The branches are numerous and slender. In the woods the head is small and irregular, while in the open it is broad and round.

The bark on the trunk is silvery-gray or light orange in color and separates into thin, persistent layers. On very old trees the trunk is rough, gray or blackish and without lustre. The young twigs are light brown, lustrous and aromatic, but to a less degree than those of the Sweet Birch.

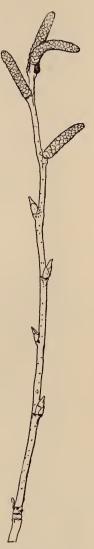
The leaves are simple, alternate, egg-shaped or approximately oblong, doubly toothed, three to five inches long and dark green and lustreless on the upper surface.

The flowers are in catkins. The winter catkins are three to four in number and not in clusters.

The wood is heavy, strong, hard and flexible. It is used in the making of furniture, in the building of carriages, for flooring and for fuel.

When this species is in clear stands it should be thinned as soon as it gets large enough for use, as it is attacked by a fungus which depreciates the value

by a fungus which depreciates the value of the stand for future results. This species takes on a deep bronze when very old.



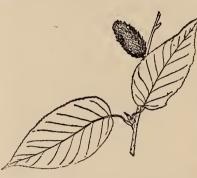
YELLOW BIRCH Winter twig. One-

SWEET OR BLACK BIRCH (Betula lenta L.)

THE Sweet Birch is of frequent occurrence throughout the State, though it rarely grows in the vicinity of the coast. Its favorite habitat is the rich, moist soil of woods or the banks of streams.

As commonly found, it is a medium-sized tree, having a height of about fifty feet and a trunk dia-

meter of one to two feet, although specimens may exceed these dimensions. The trunk is upright and the branches



SWEET OR BLACK BIRCH

Leaves and fruit.
One-third natural size.

are slender, extending almost horizontally, with the lower ones often somewhat pendulous. In the open the tree develops a symmetrical, round head.

The bark on the trunk is dark, almost black, dull and broken into large, irregular plates. On old trunks it very much resembles that of the Sweet Cherry, wherefore the term Cherry Birch is often applied to the tree. The young shoots are dark brown, lustrous and very aromatic. It is this last characteristic which justifies the name Sweet Birch.

SWEET BIRCH Winter twig. Onehalf natural size.

The leaves are simple, alternate, egg-shaped or approaching oblong, three to four inches long, sharply toothed and dark green and dull on the upper surface.

The flowers are in catkins. Of the winter ones there are three or four on a shoot.

The wood is heavy, very strong, hard, durable and easily wrought. It is used largely in the making of furniture and is highly esteemed for fuel.

HORNBEAM OR IRONWOOD (Ostrya virginiana Koch.)

THE Hornbeam, so called because of its general resemblance to the European Hornbeam, is a small, slender, round-topped tree, usually not more than twenty to thirty feet tall and eight to twelve inches through. Its branches are long, slender and somewhat drooping at the ends. It occurs commonly throughout the State, growing on gravelly and rocky

slopes, often in rather open woods.

The bark on the trunk is light brown tinged with red and breaks into fine scales. These separate easily, are narrower than the scales of any rough-barked tree and become finer and narrower as the tree grows older.

The leaves are simple, alternate, egg-shaped or nearly oblong, sharply



HORNBEAM OR IRONWOOD
Leaves and fruit. One-third natural size.

toothed, two to three inches long and very similar to those of the Blue Beech.

The flowers are borne in catkins, the sterile ones appearing in the fall, usually in clusters of three, and the fertile ones appearing in the spring.

The fruit, which ripens in September, very closely resembles a cluster of hops.

The wood is compact, close-grained, strong, tough, durable and very heavy. It is good for levers, stakes, binding poles, handles, mallets and the like.

BLUE BEECH (Water Beech) (Carpinus caroliniana Walt.)

NHABITING wet woods and the border of swamps and streams, the Blue Beech is of common occurrence throughout the State, though less frequent near the coast than inland. It is a slow-growing, small tree, ten to thirty feet high, with a short trunk not more than six to twelve inches in diameter. The

branches are irregular and crooked and extend at varying angles. The head is compact, broad and flat or somewhat roundish. The trunk is

and flat or somewhat roundish. The trunk is marked with irregular, longitudinal ridges. Its barkis smooth like that of the Beech and of a bluishgray color.

Leaves and fruit. One-third natural size. For this reason it is called the Blue Beech. The leaves are simple, alternate, egg-shaped or oval, sharply and irregularly toothed,

and irregularly toothed, two to three inches in length and very similar to those of the Sweet Birch, though the aromatic flavor is wanting. The flowers are borne in

BLUE BEECH
Winter twig. One-half natural size.

catkins. Both the fertile and the sterile ones appear in the spring.

In the fruit, the leaf-like body which subtends the nutlet is three-lobed and not inflated, differing in this respect from the fruit of the Hornbeam.

The wood is compact, close-grained, tough, durable and very strong. It is sometimes used for levers, beetles and the handles of tools.

BEECH (Fragus atropunicea Sudworth)

THE Beech is of common occurrence throughout the State, yet it is more abundant in the western sections than the eastern. Its home is on cool rocky slopes.

In habit it is a spreading tree with a broad and dense head, usually growing from fifty to sixty feet high and



Leaves and fruit. One-third natural size.

Winter twig and buds. One-half natural size.

twenty feet. The bark on the trunk is smooth and bluegray in color. It is not to be mistaken for that of any other native tree, except possibly that of the Blue Beech.

The winter buds are long and slender and taper slowly to a sharp point. The leaves are simple, alternate, oval, from three to five inches in length, coarsely serrate and green on both surfaces. The fruit is a four-valved, prickly bur which encloses a triangular nut. Its wood is hard, strong, tough, perishable and liable to warp. It is employed in the manufacture of some kinds of furniture, for shoe lasts, for the handles of tools and for fuel.

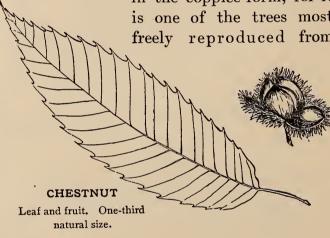
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CHESTNUT (Castanea dentata Borkh.)

HE Chestnut is found commonly throughout Massachusetts, though less frequently near the sea-coast than inland. Its habitat is rich, well-drained soil. A rapid grower and one of the tallest and straightest of our trees, it usually has a single trunk destitute of limbs for a considerable distance and a rather small, round head. However, when it is uncrowded, the trunk often separates into several stout branches which form

> a low, round head of great breadth. In the former case it often attains a height of sixty to eighty feet and has a diameter of three to four feet. Most frequently it is met with

> > in the coppice form, for it is one of the trees most freely reproduced from



CHESTNUT

Winter twig and buds. One-half natural size.

sprouts. In this case it has a height of thirty to forty feet and a diameter of eight to fifteen inches.

The bark on the trunk of a small tree is dark gray and smooth. On the old trunk it is thick and divided by shallow furrows into broad, flat ridges. On the twigs the bark is dark brown. The leaves are simple, alternate, five to ten inches in length, sharply toothed and dark yellow-green in color. The fruit is a round, four-valved, prickly bur and contains, as a rule, two to three dark brown nuts. The wood is coarse-grained, light, soft, weak, but durable when exposed to alternations of dryness and moisture. It is used in the making of furniture, for house finishing, for railway ties, fence-posts and for fuel.

Swamp White Oak

(Quercus platanoides Sud.)

OAKS

How to know the Oaks

Chestnut Oak

(Quercus prinus L.)

White Oak

(Quercus alba L.)

Bark	Bark	Bark
Light ashen-gray and broken into thin, irregular flakes.	Dark brown or almost black and divided into broad, rounded ridges.	Grayish-brown and deeply and irregularly divided into broad, flat ridges.
Leaves	Leaves	Leaves
With rounded lobes.		
Fruit	Fruit	Fruit
Matures first year.	Matures first year.	Matures first year.
Winter Buds Broadly egg-shaped, acute or obtuse at apex, and red-brown.		
Red Oak	Scarlet Oak	Yellow Oak
(Quercus rubra L.)	(Quercus coccinea Muenchh)	(Quercus velutina Lam.)
Bark	Bark	Bark
Dark gray or almost black and coarsely and irregu- larly ridged, yet never ex- tremely rough. Inner bark reddish.	Dark gray and broken into small, irregular ridges. Inner bark reddish.	Dark, almost black, and deeply divided into broad, rounded ridges. Inner bark often yellow.
Leaves	Leaves	Leaves
Lobes with sharp tips. Upper surface without lustre.	Lobes with sharp tips. Upper surface lustrous.	Lobes with sharp tips. Upper surface lustrous.
' Fruit	Fruit	Fruit
Matures second year.	Matures second year.	Matures second year.
Winter Buds Conical, reddish-brown and smooth.	Winter Buds Small, reddish-brown and smooth. Winter Buds Large, strongly angle and coated with matter wool.	

WHITE OAK (Quercus alba L.)

HE White Oak, which receives this appellation because of the light color of the bark on the trunk, grows very commonly in Massachusetts, though it is perhaps less abundant in the western sections than elsewhere. It occurs in a variety of soils and situations, usually on the lighter ground of the uplands, yet sometimes on moist land.

WHITE OAK Leaves and fruit. One-third natural size.

A tall tree, commonly developing a height of fifty to seventy-five feet and a trunk diameter of three to four feet, it shows a considerable diversity of habit. In the woods it has a tall, single stem, with a narrow head. In the open the bole is short and the large, diverging

limbs, many of them nearly horizontal, form a broad, round-topped head.

The bark on the trunk is light ashengray and broken into thin, irregular flakes.

The leaves are simple, alternate, from four to seven inches in length and usually

divided into seven lobes. The upper surface of the leaf is bright green and the lower, pale green or whitish. In the autumn the foliage turns to a deep wine-red. Not WHITE OAK Winter twig infrequently it remains on the tree during and buds. the winter. The flowers appear in May One-half natural size. when the leaves are half grown. The fruit

matures the first season and ripens in September. The acorn is about three-fourths of an inch in length, light chestnut-brown and enclosed for about one-fourth its length in the cup. Its wood is the most valuable of the native trees. It is hard, heavy, tough, close-grained and durable. It is employed for ship-timber, carriagemaking, agricultural implements and for furniture and interior finishing. The bark is valuable for tanning.

CHESTNUT OAK (Quercus prinus L.)

THIS tree derives the justification for its common name, Chestnut Oak, from the resemblance which its leaves bear to those of the Chestnut. It occurs in the eastern parts of Massachusetts, sometimes rather frequent locally, as in the Blue Hills. Usually it may be found in rich, moist soil on rocky slopes and banks.

Here it is a small or medium tree, twenty-five to forty feet in height with a trunk diameter of one to one and one-half feet. Nevertheless it may sometimes assume greater dimensions. In the former case the trunk is usually continuous. The branches are small and form a narrow, round head.

The bark on the old trunk is dark reddish-brown or almost black and divided into broad, rounded ridges which have small surface scales.

The leaves are simple, alternate, five or six inches long, oblong or lance-shaped, coarsely and irregularly scalloped, and yellowish-green and lustrous on the upper surface.

The flowers appear in May when the leaves are partially grown.

The fruit matures the first year.

The acorns are about an inch long, light brown in color and slightly or almost half enclosed by the cup.

The wood is heavy, hard, strong and durable when in contact with the soil. It is employed for fencing, for railroad ties and for fuel. The bark is used in tanning. Chestnut Oak is considered to be equal in value to the White Oak.



CHESTNUT OAK
Winter twig and buds.
One-half natural size.

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SWAMP WHITE OAK (Quercus platanoides Sud.)

THIS species gets its popular designation, Swamp White Oak, from its resemblance to the White Oak and its frequent fondness for swampy situations. Growing in rich soil along streams and swamps, it occurs throughout the State and is rather common in some of the eastern sections. In habit it bears a general likeness to the White Oak, though its branches

are not so spreading and its head is less regular and narrower. Ordinarily its height is from forty to fifty feet and its diameter is

from two to three feet.

The bark on the trunk is grayish-brown and deeply and irregularly divided into broad, flat ridges. The bark of the White Oak is somewhat lighter and the scales finer. On the young branches the scales hang loosely, giving a marked appearance to the tree.

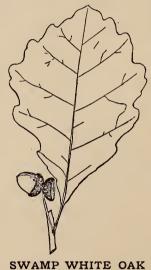
The leaves are simple, alternate, obovate or oblong, four to six inches long, scalloped or slightly

lobed and dark, lustrous green on the upper surface.

The flowers appear in May when the leaves are partially grown.

The fruit ripens the first season. The acorn is about one inch long, light chestnut-brown in color and enclosed in the cup for about one-third its length.

Its wood is very similar to that of the White Oak and only slightly inferior in quality. It is used in construction, in carriage-building, for interior finishing, for furniture and for fuel.



SWAMP WHITE OAK
Leaf and fruit. One-third
natural size.

SWAMP WHITE OAK

Winter twig and buds. One-half natural size.

RED OAK (Quercus rubra L.)

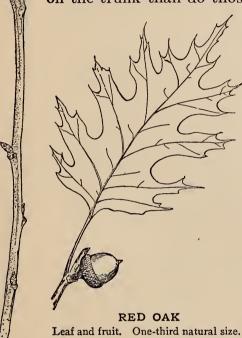
THE Red Oak is very abundantly distributed throughout Massachusetts. It occurs in various soils and in various situations, excepting, however, wet land.

One of the most rapid-growing of the Oaks and the largest of the native species, it attains a height of sixty to seventy feet and a diameter of three to four feet. Frequently a specimen exceeds these dimensions. Normally the trunk is continuous. The branches are

> stout, upright or horizontal, develop higher up on the trunk than do those of the White Oak

> > and form a narrow or sometimes broad

> > The bark on the young tree is smooth and gray. On the old it is dark gray or almost black and ridged coarsely and irregularly, yet never becoming extremely rough. The leaves are simple, alternate, five to eight inches in length and variable in outline.



RED OAK Frequently they are oblong and show seven to nine lobes. The upper surface is a dull, dark Winter twig and buds. green and the lower surface is yellowish-green. The flowers, the earliest of the Oaks, appear in late April or early May when the leaves are partially The fruit matures the second season. The acorn is from three-fourths to one and one-fourth inches in length and is larger than that of any other

native Oak. The wood is heavy, hard and strong. It is less valuable than that of most of the Oaks, though it is used for furniture and interior finishing. For

SCARLET OAK (Quercus coccinea Muenchh)

THE deep scarlet which the leaves assume in the autumn is responsible for the popular name which the tree possesses. Normally growing on dry soil, it occurs abundantly in the eastern sections of Massachusetts, frequently in the central portion and only rarely in the western.

As to habit, it is usually a medium-sized tree, thirty to fifty feet in height and one to two feet in

diameter. The trunk is straight and tapering. The branches are slender, horizontal and drooping towards the ends. The head is rather narrow and open.

The bark on the old trunk is dark gray and broken by shallow fissures into irregular ridges. The inner bark is reddish.

The leaves are simple, alternate, three to six inches in length, variable in outline but usually oblong or egg-shaped, divided into seven or sometimes nine lobes and bright, lustrous green on the upper surface.

The flowers appear in May when the leaves are about half grown.

The fruit matures the second season. The acorn is about one-half inch long, bright reddish-brown, often striped and enclosed in the cup for about one-half its length.

The wood is heavy, hard and strong. In value it ranks a little lower than that of the Red Oak and serves to a limited extent for the same purposes.

Chiefly because of its beautiful autumnal coloring it is rather commonly planted for ornamental purposes.



SCARLET OAK Winter twig and buds. One-half natural size.

YELLOW OAK (Quercus velutina Lam.)

THE Yellow Oak, or, as it is more frequently called, the Black Oak, occurs in all parts of Massachusetts and is really abundant in the eastern sections. Its usual home is on poor soil, particularly on gravelly uplands and ridges.

As to habit, it is intermediate between the Red Oak and the Scarlet Oak. The trunk commonly attains a height of fifty to sixty feet and a diameter of two to three feet. The branches are stouter than those of



Leaf and fruit. One-third natural size.

the Scarlet Oak, yet not so stout as those of the Red. The head is narrow and roundish.

The bark on young stems is smooth and dark gray or brown. On old trunks it is dark, almost black, and is deeply divided into broad, rounded ridges. In this last respect it differs from the Red Oak, the bark of which has flat ridges and is never quite so rough.

The winter buds are large, strongly angled and covered with a matted, woolly growth.

The leaves are very variable, sometimes resembling those of the Scarlet and sometimes those of the Red Oak. They are simple, alternate, egg-shaped or ob-

Yellow Oak — Concluded

long, mostly seven-lobed, sometimes divided nearly to the midrib and again nearly entire, and dark green and glossy on the upper surface.

The flowers appear in the early part of May when the leaves are nearly half grown.

The fruit matures the second year. The acorn is one-half to three-fourths of an inch long, light redbrown, often marked with lines of a darker color and enclosed in the cup for about one-half its length.

The wood is heavy, hard, coarse-grained and strong. It has little use except for fuel. The bark is used in tanning and in medicine.



YELLOW OAK

Winter twig and buds. One-half natural size.

ELMS

How to know the Elms

Slippery Elm (Ulma pubescens Walt.)	White Elm (Ulmus americana L.)
Habit	Habit
Medium height. Head broad and almost flat.	Tall and variable in outline, yet typically vase-shape.
Bark on Trunk	Bark on Trunk
Dark brown tinged with red. Inner bark mucilaginous.	Ashy-gray. Inner bark not mucilaginous.
Leaves	Leaves
Very rough on the upper surface and nearly as rough on the lower.	Somewhat rough on the upper surface and smooth on the lower.
Winter Buds	Winter Buds
Dark brown and covered with rusty hairs.	Brown and smooth.



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SLIPPERY ELM (Ulmus pubescens Walt.)

HE Slippery Elm, a common name attached to this species because of the mucilaginous inner-bark, is very rare or wanting in the eastern sections of the State, but is rather frequent in the western parts. It has a

preference for low, rich soil, though it some-

times occurs on higher ground.

In habit it is a lower tree than the American Elm and, in proportion to its height, more spreading. It is a medium-sized tree, attaining a height of forty to fifty feet and a trunk diameter of one to two feet. The head is very broad and almost flat.

The bark on the trunk is thick, dark brown tinged with red, divided by shallow fissures into flat ridges and covered with

flat scales.

The winter buds are obtuse, dark brown in color and covered with rusty hairs.

The leaves are simple, alternate, four to six inches long, sharply doubly toothed, dark green and very rough on the upper surface and rough on the under-surface.



SLIPPERY ELM Leaves and fruit. One-third natural size.

The flowers appear before the leaves about the middle of April and the small fruit ripens in late spring.

The wood is very similar to that of the American Elm, being heavy, strong and durable. It is employed in the manufacture of agricultural implements, for the hubs of wheels, in the construction of vessels and for fence-posts.



SLIPPERY Winter twig One-half natural size.

WHITE OR AMERICAN ELM (Ulmus Americana L.)

THE American Elm is very common everywhere in Massachusetts and reaches its maximum development in the Connecticut Valley. Its favorite habitat is the moist ground along streams and rich bottom-lands.

Its graceful habit, typically vase-shape, yet often varied, is very familiar. Commonly from fifty to sixty feet in height, it often grows to a height of one hun-



Winter twig and buds. One-half natural size.

dred feet or more and

acquires a trunk diameter of six to ten feet. It is usually a quick-growing

The bark on the trunk is ashy-gray, thick and divided by deep fissures into flat ridges which separate into thin scales.

The leaves are simple, alternate, two to five inches in length, coarsely

doubly toothed and dark green and somewhat rough on the upper surface.

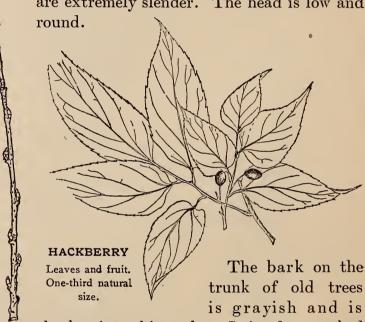
The flowers appear in late March or early April before the leaves, and the small, winged fruit ripens in May before the leaves are fully developed.

The wood is heavy, hard, strong and tough. It is employed for the hubs of wheels, in boat and ship building, for flooring and in cooperage.

HACKBERRY (Celtis occidentalis L.)

GROWING in various situations, sometimes in moist, rich ground, yet more frequently on gravelly soil or rocky hillsides, it occurs occasionally throughout the State, nevertheless it is somewhat more abundant in the southeastern sections near the coast. Here it is a slow-growing tree, of medium dimensions, and attains a height of twenty to forty feet and a diameter of eight

to twenty inches. Its habit is somewhat variable. The trunk is short and the branches are stout, spreading and angular. The twigs are extremely slender. The head is low and round



Winter twig and buds. Onehalf natural size. broken into thin scales. It is often marked with ridges or with varying excrescences. The bark on the season's shoots is reddishbrown

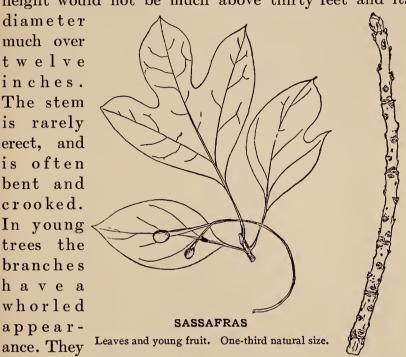
The leaves are simple, alternate, two to four inches long and variable in outline. They bear some resemblance to the leaf of the American Elm. The flowers are greenish and appear in May with the leaves.

The fruit is a globular drupe about one-fourth of an inch in diameter. The flesh is sweet and the outer surface is purplish-red, changing in winter to brownish-orange. The wood is heavy, rather soft, weak and quick to decay. It is employed in making the cheaper grades of furniture.

SASSAFRAS (Sassafras sassafras Karst.)

HE Sassafras occurs in almost every part of Massachusetts. It grows in various soils and situations but prefers a rich, somewhat sandy, well-drained soil. For the most part it is a small tree. Usually its height would not be much above thirty feet and its

diameter much over t w e l v e inches. The stem is rarely erect, and is often bent and crooked. In young trees the branches havea whorled appear-



are always short and stout, and frequently

they are contorted. The head is narrow and flat. The bark of the old trunk is thick, dark reddish-brown and strongly ridged.

SASSAFRAS Winter twig and buds. Onehalf natural

On young stems the bark is greenish and finely striate. The twigs are yellowish-green and have strong aromatic properties, as does the bark of all the parts.

The leaves are simple, alternate and of greatly varying outline. Sometimes they are entire and then again they are three-lobed. In summer the foliage is dark green and in the autumn it turns to yellow or to orange tinged with red. The flowers are small, greenish-yellow and appear in May when the leaves are unfolding.

The fruit is a small, dark blue, lustrous berry which ripens in early fall. The wood is light, soft, brittle and very durable when in contact with the soil. It is used for posts, in construction of light boats and in cooperage. The roots supply the oil of sassafras.

SYCAMORE (Buttonwood) (Platanus occidentalis L.)

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THIS, the largest of the New England trees, occurs occasionally throughout the State, frequenting the borders of streams and rich bottom-lands. It grows from fifty to one hundred feet in height and has a trunk diameter of three to eight feet. The trunk may spread near the ground into several large, secondary limbs, or it may rise without branching for a considerable distance and then have large, spreading branches.

The branchlets are very often tufted in appearance, due to the activities of a fungus. The bark on the trunk and large



SYCAMORE
Leaf and fruiting head. One-third natural size.

SYCAMORE
Winter twig and buds. One-half natural size.

limbs is greenish-gray in color and flakes off in broad scales, exposing the inner bark which is at first whitish or light green, then darker. The leaves are simple, alternate, three to five lobed and light green.

The base of the leaf-stalk is swollen and includes the winter bud. The fruit is in the shape of a ball and is about an inch in diameter. It contains very many small seeds and usually remains on the tree until spring. The wood is hard and firm but very perishable when exposed to the weather, and liable to warp. It is used for tobacco boxes, furniture and interior finish of houses. It is fairly good for fuel.

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WILD RED CHERRY (Bird Cherry)

(Prunus pennsylvanica L. f.)

THE Wild Red Cherry is a tree of little value, which often takes possession of areas cleared by fire. It occurs in the State, being more abundant in the central and western sections than elsewhere. While it grows in a variety of situations, it really prefers a moist, rich soil.

In habit it is a small tree, seldom exceeding a height of twenty-five to thirty feet and a diameter of ten inches. The trunk is continuous and the branches slender. The head is narrow and roundish or oblong.



WILD RED CHERRY
Leaves, flowers and fruit. One-third natural size.

The bark on the young trunk is smooth and reddish brown, while in the old it is dark red-brown and broken into thin plates. The inner bark possesses bitter, aromatic properties.

The leaves are simple, alternate, oblong or lanceshape, three to four inches in length, finely toothed on the margin and bright green and lustrous on the upper surface.

The flowers appear in May when the leaves are about half grown. They are white and occur in clusters of four or five.

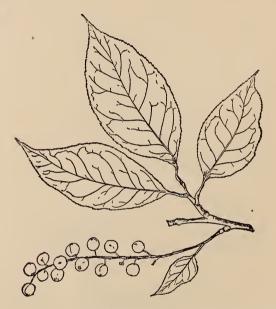
The fruit is globular in shape, a little larger than a pea and bright red.

The wood is light and soft and without economic value.

BLACK CHERRY (Prunus serotina Ehrh.)

FOR the economic value of its wood, the Black Cherry is the most important of the native Cherries. It is of common occurrence in all parts of the State, growing on many soils and in many situations, yet preferring moist, rich ground.

As to habit, though sometimes a mere shrub, it usually reaches a height of thirty to forty feet and acquires a diameter of ten to fifteen inches,—at times even exceeding these dimensions. The trunk is usually continuous and the branches are small and horizontal. The head is narrow and oblong.



BLACK CHERRY
Leaves and fruit. One-third natural size.

The bark on young stems is red-brown and somewhat lustrous. On the old trunk it is darker and broken into small, irregular plates. The inner bark is bitter to the taste.

The leaves are simple, alternate, oblong to lanceoblong in shape, three to five inches in length, the margin notched with fine teeth, somewhat leathery in texture and dark green and lustrous on the upper surface.

The flowers appear in late May or early June, when the leaves are only half grown. They are small, white

BLACK CHERRY — Concluded

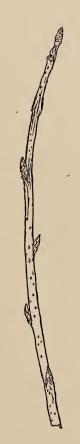
and borne in many-flowered racemes which are four to five inches in length.

The fruit is globular, about the size of a pea, dark

purple in color and usually slightly bitter.

The wood is light, close-grained, rather hard, not liable to warp and capable of taking a good polish. It is employed in cabinet-making and for interior finishing.

The fruit and bark possess valuable medicinal properties.



BLACK CHERRY

Winter twig and buds. One-half natural size.

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LOCUST (Robima pseudacacia L.)

ALTHOUGH the Locust is not native to the State, it has become so thoroughly naturalized that it is as common as many of the indigenous species. It prefers rich ground, yet it is found in various soils and situations.

When young it is a rapid-growing tree, often attaining a height of twenty feet in half as many years. After that period its increase is much slower. Here it is usually a small tree, from twenty-five to fifty feet in height and from eight inches to two feet in diameter. The trunk is erect or sometimes oblique and irregular. The branches are small and brittle and form a narrow, oblong head.

The bark on the old trunk is dark gray, thick and deeply and irregularly furrowed. The young branches are armed with spines which disappear as the tree ages.

The leaves are pinnately compound and composed of seven to twenty-one leaflets. The individual leaflets are small, about an inch or an inch and a quarter in length and oval in outline.

The flowers, which appear in early June after the leaves unfold, are borne in loose racemes, four to five inches in length. They are creamy-white, showy, fragrant and much frequented by bees.

The fruit is a pod which is smooth, flat, dark brown and about three inches in length.

The wood is heavy, exceedingly hard, strong and very durable when in contact with the soil. It is employed for shipbuilding, for fence-posts, in turnery and for fuel.

MAPLES

How to know the Maples

			
Striped Maple (Acer pennsylvani- cum L.)	Sugar Maple (Acer saccharum Marsh.)	Silver Maple (Acer saccharmum L.)	Red Maple (Acer rubrum L.)
Habit	Habit	Habit	Habit
A shrub or small, erect tree. Trunk continuous.	When young the outline is usually narrowly egg-shaped. Later it may become roundish. Trunk continuous.	Normally, trunk separates at a few feet from ground into three or four upright stems. Branches slender and often pendulous.	Trunk upright and usually continuous. Occasionally it divides into 2 or 3 upright stems. Head narrow and roundish.
Bark on Trunk	Bark on Trunk	Bark on Trunk	Bark on Trunk
Reddish-brown or dark green with whitish longitudinal striations.	Gray in color. On old trunk, rough with long ascending scales which project irregularly at the edges.	Dark gray with a reddish tinge. More or less furrowed. Separates into thin scales.	Dark gray. Marked by longitudinal ridges and broken into plate-like scales.
Leaves	Leaves	Leaves	Leaves
Roundish, 3-lobed and finely and sharply doubly toothed.	Usually 5 lobes, sometimes 3. Bays between lobes rounded. Lobes sparingly toothed	Usually 5 lobes, rarely 3. Lobes long, narrow and toothed. Silvery white on under-surface.	Lobes 3 to 5. Lobes broad and irregularly doubly serrate or toothed. White on undersurface.
Flowers	Flowers	Flowers	Flowers
Bright yellow, in slender racemes. Appear when leaves are fully developed.	Greenish-yellow, in clusters, on long, threadlike stalks. Appear with the leaves.	Greenish-yellow or pinkish, in clusters. Appear long before the leaves.	Scarlet or yellow- ish-red, in clusters. Appear before the leaves.



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STRIPED MAPLE (Acer pennsylvanicum L.)

THIS Maple is of common occurrence in the central and western sections of Massachusetts, but rare or absent near the coast. In the tree form it is slender and graceful, attaining a height of twenty to twenty-five feet and a diameter of five to eight inches. Its favorite habitat is cool, rocky woods.

The bark on the trunk is reddish-brown or dark green, striped longi
STRIPED MAPLE
Leaf and fruit. One-third natural size.

tudinally with whitish lines which in time turn brown. The bark on the twigs is bright reddish-brown.

STRIPED MAPLE Winter twig and buds. One-half natural size.

The leaves are simple, opposite, from five to six inches in length and nearly as broad, three-lobed and pale green. In the autumn they change to a clear, light yellow.

The flowers, which are bright yellow in color, appear in slender racemes in late May or early June when the leaves are fully developed.

The wood is light, soft and without direct commercial value.

SUGAR MAPLE (Rock Maple) (Acer saccharum Marsh.)

THE Sugar Maple may be found abundantly throughout the State, although its occurrence is much less frequent toward the seacoast. Wherever it may grow, it is much at home in cool, rich woods and on moist, rocky slopes. Normally, it is a tree growing from fifty to sixty feet high, yet it often reaches a height of at least one hundred feet. In the open the branches

develop at a distance of eight or ten feet above the ground and make an acute angle with the trunk, thus forming, at least when the tree

is young, an egg-shaped head. Later in life the tree may assume a roundish form.

The bark on the old trunk is gray and roughened with long vertical scales which project irregularly at the edges. The young twigs



Leaf and fruit. One-third natural size.

SUGAR MAPLE

are reddish-brown in color and lustrous.

The leaves are simple, opposite, from three and buds. to five inches in length and have three to five lobes. The upper surface of the leaf is dark green, and the under-surface is pale green. In the autumn the foliage takes on brilliant shades of red, scarlet and orange. The flowers, which are greenishyellow in color, are borne on long, thread-like flower stalks and appear about the middle of April.

The wood is heavy, hard, durable, close-grained and capable of taking and retaining a good polish. It is used largely in the interior finish of buildings, in the making of furniture and in shipbuilding.

SILVER MAPLE (Acer saccharinum L.)

THE Silver Maple is met with occasionally in the central part of the State, though in the eastern sections it is rare or absent. It grows chiefly along streams and in rich intervales.

Normally, it is a tree from fifty to sixty feet in height, having a trunk which separates at a few feet from the ground into three or four upright stems that are destitute of branches for a considerable distance.



SILVER MAPLE

Leaves and fruit. One-third natural size.

The branches proper are long, slender and not infrequently pendulous.

The bark on the trunk is dark gray with perhaps a reddish tinge, more or less furrowed and separates into large, thin scales. The bark on the twigs is chestnut-brown in color and lustrous.

The leaves are

simple, opposite, from six to seven inches in length and deeply five-lobed. The upper surface of the leaf is pale, while the lower surface is silvery-white. In autumn the foliage becomes a pale yellow.

The flowers, which are greenish-yellow or sometimes pinkish, appear before the leaves, in late March or early April.

The wood is soft, weak and perishable. It is used in the making of furniture and sometimes for floors.

RED MAPLE (Acer rubrum L.)

GROWING in a variety of situations, though usually where it is wet, the Red Maple appears commonly throughout the State. It is a rapid-growing tree of medium size, with a low, narrow, round head. Normally, it rises to a height of forty to fifty feet and has a diameter of one to two feet. Usually the trunk

is continuous, though occasionally it divides into two or three upright stems. The branches proper are rather slender and come

out at varying angles with the trunk.

The bark on older trees is dark gray, marked by longitudinal ridges and broken with plate-like scales. On the young shoots the bark is red and shiny.

The leaves are simple,

RED MAPLE

Leaf and fruit. One-third natural size.

opposite, from three to four inches in length and have from three to five lobes. The upper surface of the leaf is light green and the under-surface white. In the fall the

MAPLE
Winter twig and
buds. One-half
natural size.

RED

green gives place to varying shades of scarlet or scarlet and orange.

The flowers appear before the leaves, in early April, and are scarlet or yellowish-red. Likewise, the fruit, which ripens in June, has a reddish coloring.

The wood is heavy, close-grained, easily worked and capable of taking a good polish. However, it lacks strength and decays speedily when exposed to alternations of moisture and dryness. It is used in the making of furniture, in turnery, for gun-stocks and for fuel.

BASSWOOD OR LINDEN (Tilia americana L.)

HE Linden is found in rich, moist soil in almost every part of the State. In habit it is a large tree, with an average height of fifty to sixty feet and a diameter of two to three feet. The branches are very numerous, comparatively small and slender and often somewhat pendulous. The head may be broad

and round-topped or it may be conical. On young trees the bark is gray and smooth, while on older trunks it is darker and deeply and irregularly furrowed. twigs are yellowish-green or reddish-brown

in color.

The leaves are simple, alternate, very broadly eggshaped, from four to five inches in length a n d toothed.

The flowers are greenish - yellow and appear in late June or early July. The stalk which bears the flowers is attached to an

oblong, yellowish, leaf-like body. The flowers themselves are pleasantly fragrant and rich in honey.

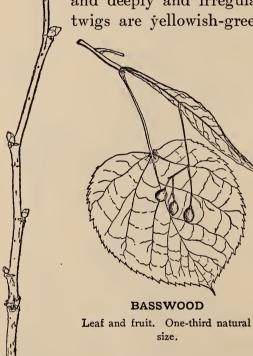
The fruit is globular, about the size of

a pea, woody and gray in color.

The wood is light, close-grained, soft and more tough and pliable than almost any other wood. It is employed for paper pulp, in carriagemaking, for furniture and for wooden utensils.

BASSWOOD

The tree is a favorite with bee-keepers, for bees collect from its flowers a large amount of honey of a very desirable quality.



BASSWOOD Winter twig and buds. Onehalf natural

BLACK GUM OR TUPELO (Nyssa sylvatica Marsh.)

THE Black Gum occurs rather commonly throughout Massachusetts, where it inhabits the borders of swamps and streams.

Here it is a small or medium-sized tree, of slow growth and of very variable habit. Its height development ranges from twenty-five to fifty feet and its diameter from one to two feet. The branches are slender

and angular, the lower ones horizontal or slightly drooping and the upper horizontal or slightly rising. The head is of vary-

ing form, cylindrical, conical, pyramidal, often flattopped and usually picturesque.

The bark onthe trunk is dark gray. On the old trunk it is divided



One-half natural size.

The leaves are into many small scales. simple, alternate, entire and from two to five inches long. In summer the leaves are dark green and lustrous on the upper surface. In the autumn the foliage takes on brilliant hues of scarlet and crimson.

BLACK GUM Winter twig and buds. One-

half natural size.

The fruit, which ripens in October, is about onehalf inch long, blue-black and sour.

Its wood is heavy, soft, strong and not very durable. It is used for the hubs of wheels, for rollers and piles. It is difficult to split; hence, when it is made to serve for fuel, the logs are usually employed.

ASHES

How to know the Ashes

Black Ash

(Fraxinus nigra Marsh.)

Leaves

Leaslets 7 to 11 and without stalks, excepting the terminal one.

Winter Buds and Twigs

Buds black. Shoots olive-green, smooth.

White Ash

(Fraxinus americana L.)

Leaves

Leaflets 7 to 9 and supported by short stalks.

Winter Buds and Twigs

Buds brown. Shoots olive-green, smooth and lustrous.

Red Ash

(Fraxinus pennsylvanica Marsh.)

Leaves

Leaflets 7 to 9 and supported by short stalks.

Winter Buds and Twigs

Buds brown. Shoots greenish and more or less covered with down.



BLACK ASH (Fraxinus nigra Marsh.)

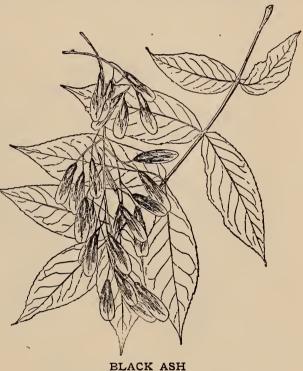
THE Black Ash is found to a certain extent throughout the State, though more abundantly in the central and western portions than in the eastern. It confines itself almost exclusively to rich, moist ground in the vicinity of streams and swamps.

In habit it is a very slender tree, usually growing to a height of sixty to seventy feet and having a diameter of one to two feet. In the woods the trunk is slim and without branches until near its very top.

In the open it may have a broad, round head.

The bark on the trunk is dark gray and marked by parallel ridges. The season's shoots are olive-green and smooth, and the buds are black.

The leaves are opposite, twelve to fifteen inches



Leaf and fruit. One-third natural size.

in length and consist of seven to eleven leaflets. These are oblong, four to five inches long, remotely toothed and without stalks, except in the case of the terminal one.

The flowers and fruit for all superficial purposes resemble those of the White Ash.

The wood is heavy, soft, tough and durable. It is used in cabinet work, for interior finishing, for hoops and for baskets. For this last purpose it is held in very high esteem.

WHITE ASH (Fraxinus americana L.)

THIS rapid-growing tree occurs in all parts of Massachusetts and on every kind of ground, although it thrives best in deep, rich soil in the vicinity of streams.

As to habit, it usually attains a height of fifty to seventy-five feet and a trunk diameter of two to three feet. In the open the trunk divides at a few feet from the ground into two or three large limbs, then assumes a broad, round head.



Leaf and fruit. One-third natural size.

The bark on the trunk is dark brown or deep gray. It is deeply divided by furrows, which are parallel or connect at intervals into broad, flattened ridges. The season's shoots are olive-green and smooth.

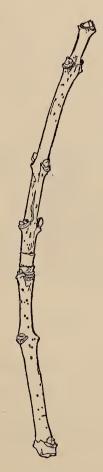
The leaves are opposite, eight to twelve inches in length and composed of seven to nine leaflets. The individual leaflets are egg-shaped or oblong, three to five inches in length, stalked, remotely toothed and dark green on the upper surface.

The flowers appear in May before the leaves.

WHITE ASH - Concluded

The fruit is a winged body, oblong in shape and one to two inches in length. It ripens in late August or September and often hangs on into the winter.

It is a valuable forest tree and the most useful of the Ashes. The wood is heavy, hard, strong, tough and elastic. It has many uses. It is employed in the manufacture of agricultural implements, in the making of furniture, for the handles of tools, in carriagebuilding and sometimes for interior finishing.



WHITE ASH

Winter twig and buds. One-half natural size.

RED ASH (Fraxinus pennsylvanica Marsh.)

HE Red Ash, not infrequently mistaken for the White Ash, occurs occasionally throughout Massachusetts. Its home is in low, rich soil near streams and swamps.

In habit it is very much like the White Ash, though it is usually smaller in every way. It seldom grows to a height of more than fifty or sixty feet and its diameter rarely exceeds eighteen to twenty inches. In the open the head is rather broad and round-topped.



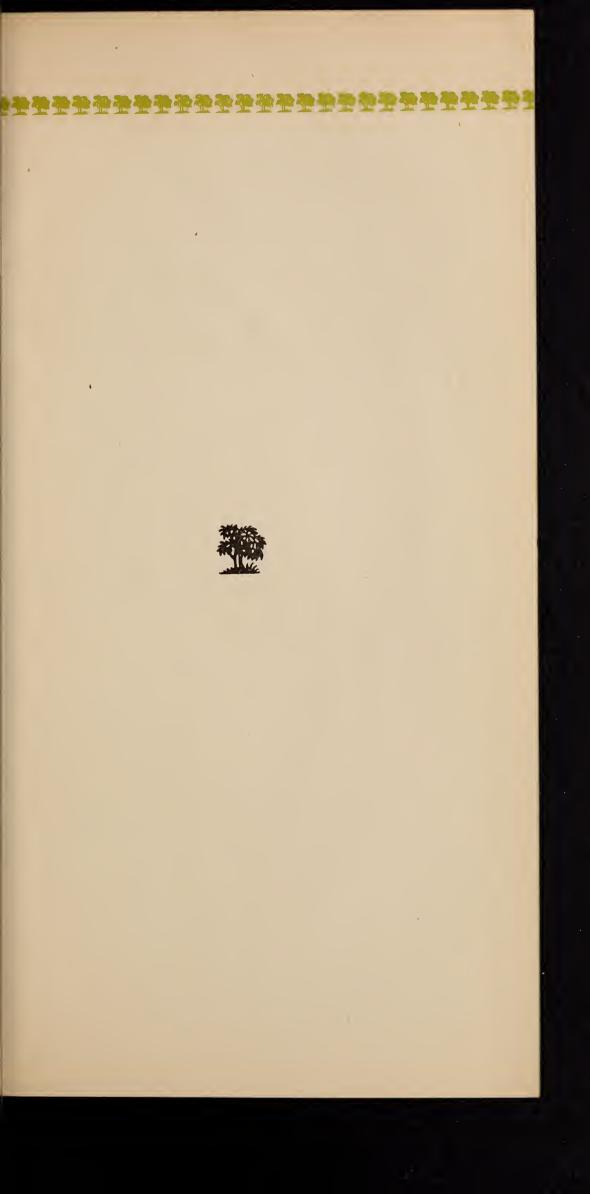
Leaf and fruit. One-third natural size.

The bark on the trunk of a mature tree is dark gray or brown and furrowed, but less deeply and more regularly than in the case of the White Ash. The season's shoots are greenish-gray and coated with numerous fine hairs which often persist until the second season.

The leaves are opposite, compound, ten to twelve inches in length and composed of seven to nine leaflets.

The flowers and fruit, to all intents and purposes, are similar to those of the White Ash.

The wood is heavy, hard and brittle. It is much inferior to that of the White Ash, though it is used for many of the same purposes.













AMHERST, MASS,



How You May Know Them



A POCKET MANUAL

By D. A. Clarke, under the direction of F. W. Rane, State Forester, State House, Boston, Mass., U. S. A.

25.3

CONTENTS

	PAGE		PAGE
Pine Trees. Key for identifying.	. 5	Beech Tree	. 35
White Pine Tree	. 6	Chestnut	. 36
Red Pine or Norway	. 8	Oak Trees. Key for identifying .	. 37
Pitch Pine	. 9	White Oak	. 38
Tamarack or Larch	. 10	Chestnut Oak	. 39
Spruce Trees. Key for identifying	. 11	Swamp White Oak	. 40
Black Spruce	. 12	Red Oak	. 41
Red Spruce	. 13	Scarlet Oak	. 42
Hemlock	. 14	Yellow or Black Oak	. 43
White Cedar	. 15	Elm Trees. Key for identifying	. 45
Red Cedar or Juniper	. 16	Slippery Elm	. 46
Walnut Trees. Key for identifying	. 17	White or American Elm	. 47
Butternut	. 18	Hackberry	. 48
Black Walnut	. 19	Sassafras Tree	. 49
Hickory Trees. Key for identifying	. 20	Sycamore or Buttonwood Tree	. 50
Bitternut Hickory	. 21	Wild Red Cherry	. 51
Shagbark Hickory	. 22	Black Cherry	. 52
Mockernut Hickory	. 23	Locust Tree	. 54
Pignut Hickory	. 24	Maple Trees. Key for identifying	. 55
Poplar Trees. Key for identifying	. 25	Striped Maple	. 56
Aspen (American)	. 26	Sugar or Rock Maple	. 57
Aspen (Largetooth)	. 27	Silver or Soft Maple	. 58
Birch Trees. Key for identifying	. 28	Red Maple	. 59
Gray Birch	. 29	Basswood or Linden Tree .	. 60
Paper or White Birch	. 30	Black Gum or Tupelo	. 61
Yellow Birch	. 31	Ash Trees. Key for identifying.	. 62
Sweet or Black Birch	. 32	Black Ash	. 63
Hop-Hornbeam or Ironwood .	. 33	White Ash	. 64
Blue Beech or Hornheam	34	Red Ash	. 66

THE COMMERCIAL

FOREST TREES

OF MASSACHUSETTS

HOW YOU MAY KNOW THEM



A POCKET MANUAL

By D. A. Clarke, under the direction of F. W. Rane, State Forester, State House, Boston, Mass., U. S. A.



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THIRD EDITION

APPROVED
BY THE STATE BOARD OF PUBLICATION



PURPOSE OF THIS HANDBOOK

THIS handbook has been planned and published by the State Forester in order to have a practical working description of the commercial trees at the command of Massachusetts citizens.

Technical terms necessarily used in botanical and forestry books are bewildering to the practical, everyday lumberman, farmer or average person. The attempt, therefore, of this treatise is to point out clearly how one can tell the commercially valuable trees of Massachusetts in a plain and untechnical manner.

The really most important points or characters the tree has, which distinguish it from all others, are first pointed out. This will be all many persons may care to know. If five needles growing in a cluster always denote a white pine, for example, and people have their attention called to it, few will ever mistake that tree for others. They can settle the matter easily by examining the tree for themselves. Likewise, other trees can be told by following the same plan of identification.

Acknowledgments

Mr. Daniel A. Clarke, a Harvard instructor and man of recognized experience and ability in forest botany, was selected to prepare this manuscript. The individual characteristics for identifying each species are Mr. Clarke's arrangement.

The cuts illustrating the foliage and seed production were kindly loaned the State Forester by Director J. L. Hills of the Vermont Experiment Station. These cuts were used to illustrate a bulletin on "The Trees of Vermont," prepared under the direction of Prof. L. R. Jones of the University of Vermont.

The cuts illustrating the winter twigs and buds are from originals made by Miss Helen B. Mason, from carefully-selected specimens collected by Mr. Clarke.

Six cuts, credited under each, are from Sargent's "Manual of the Trees of North America," by permission of Houghton, Mifflin & Co.



It is hoped this handbook will be a source of inspiration toward assisting people, generally, in knowing our trees.

When we shall have created in our people, from youth up, a natural inborn love for Nature, the fundamentals of practical forestry will solve themselves as naturally as water flows down hill. Meanwhile, we have a pleasant task in bringing these conditions about. The more one knows about trees, the more he wants to know; and the natural outcome will be both better economic and æsthetic conditions.

This handbook is offered by the State, free of charge, believing that the persons possessing it will find it a useful and helpful companion.

F. W. RANE, State Forester

PINES

How to know the Pines

White Pine

(Pinus strobus L.)

Leaves

Arranged in 5-leaved clusters. Slender, flexible, bluish-green and 3 to 5 inches long.

Red Pine

(Pinus resinosa Ait.)

Leaves

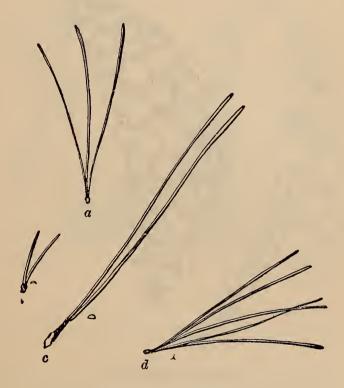
Arranged in 2-leaved clusters. Flexible, dark green and 5 to 6 inches long.

Pitch Pine

(Pinus rigida Mill.)

Leaves

Arranged in 3-leaved clusters. Stiff, dark yellowgreen and 3 to 5 inches long.



PINE LEAF CLUSTERS

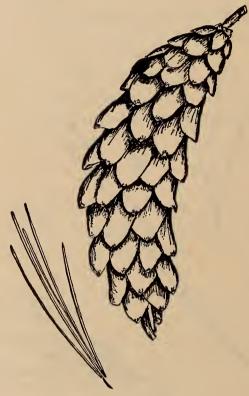
a, Pitch; c, Red; d, White. All one-half natural size.

Note. — The Austrian and Scotch Pines are sometimes planted in Massachusetts. Both are introduced or imported. The Scotch Pine has two leaves in a cluster, two to four inches long, flat and of a bluish-white hue. The Austrian has dark green, slender, rigid leaves, two in a cluster, four to six inches long.

WHITE PINE (Pinus strobus L.)

THE White Pine is abundantly distributed throughout the State. It occurs on fertile soil, in moist situations, or on uplands.

When standing in the open, the young tree has a symmetrical, pyramidal outline. In the forest, its trunk is usually without branches for a considerable distance and the head is narrow. In old age the tree becomes



WHITE PINE CONE

With scales open and seeds gone. White Pine needles grow in clusters of five.

very irregular and picturesque. The trunk is continuous, gradually tapering, commonly from fifty to seventy feet in height and one to two feet in diameter. The branches are usually in whorls of five and extend horizontally.

The bark on young stems is thin, green tinged with red. On the old trunk it is thick and almost black, and divided by shallow fissures into broad, flat ridges.

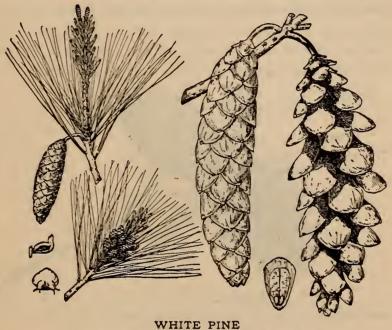
The leaves are arranged in clusters of five. They are

White Pine - Concluded

from three to five inches in length, bluish-green on the upper surface and whitish on the under.

The cone is cylindrical and from four to six inches in length. The seeds are small and winged. The cones open early in September of their second season.

The wood is very useful. It is light in color, light in weight, durable, except when in contact with the soil, and not easily warped by the sun. It supplies



Embryo and Mature cones. One-half natural size.

From Sargent's "Manual of the Trees of North America," by permission of Houghton, Mifflin & Co.

boards of good size, free from knots and of light weight. It is sawed into lumber, shingles and laths. It is used in cabinet-making, for interior finishing and for masts. In this State it is very largely worked into "box-boards" for the making of boxes. Then, in addition to serving so well these various utilitarian ends, it is a rapid-growing tree, increasing in height on the average at least a foot each year. So, all in all, the White Pine is one of the most valuable trees in the State and most deserving of being grown for forestry purposes.*

^{*} Send to the State Forester for a pamphlet, "How and When to collect White Pine Seed."

RED PINE (Norway Pine) (Pinus resinosa Ait.)

N Massachusetts the Red Pine — appropriately so called both on account of the pale red color of the heart-wood and the distinctly reddish cast of the bark — occurs only locally and then chiefly in the northern and western sections. Usually it grows on light and somewhat dry soils.

When young it has an attractive conical outline; in old age it becomes somewhat irregular. It usually attains a height of fifty to seventy-five feet and has a continuous trunk, two to three feet in diameter. The branches are stout, usually extend horizontally and clothe the trunk quite or nearly to the ground.



RED PINE.—One-half natural size.

From Sargent's "Manual of the Trees of North America," by permission of Houghton, Mifflin & Co.

The bark is light red-brown in color and divided by shallow fissures into broad, flat ridges.

The leaves are in clusters of two, flexible, dark green and five to six inches long. They remain on the tree for four or five years.

The cones are egg-shaped, two to three inches long and mature in the fall of their second season.

The wood is light, strong, hard and pale red in color. It is used in construction, for building, and to a certain extent for masts.

The name Norway Pine has so little fitness as applied to this tree, and is so evidently misleading that its use is to be discouraged.

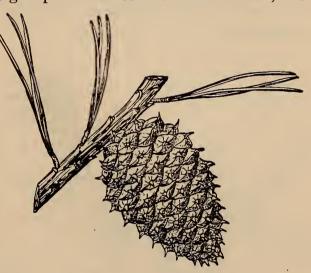
The Latin name suggests a resinous wood, but in fact it is less so than either of the other Pines.

PITCH PINE (Pinus rigida Mill.)

THE Pitch Pine grows in poor, sandy and gravelly soil in all parts of the State, often forming a considerable tract of almost pure growth, as in the southeastern sections near the coast.

In habit it is usually a low tree with irregular and variable outline. Normally, the height is from thirty to forty feet and the diameter from one to two feet. The trunk is continuous, straight and tapers rapidly. The branches, grouped in threes about the trunk, are

thick and often contorted. The bark on young stems and branches is rough. On old trees it is deep gray or reddishbrown, and irregularly divided into broad, flat, continuous ridges. The



PITCH PINE. - One-half natural size.

continuous From Sargent's "Manual of the Trees of North America," by permission of Houghton, Mifflin & Co.

leaves are in clusters of three. They are three to five inches long, stiff, dark yellow-green and fall during their second year.

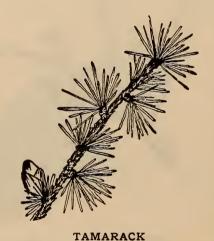
The cones are one to three inches long and light brown in color. They often remain on the tree for ten or twelve years. The scales are tipped with sharp prickles,—a character likely to aid in the recognition of the species.

The wood is light, soft and brittle. It is sometimes sawed into coarse lumber and is used for charcoal and for fuel. It is chiefly valuable because it will do well on extremely sterile soil, although it is a slow grower. Turpentine and tar were once made from this species in New England. There is a growing tendency to use this species for box-board lumber.

TAMARACK (Hacmatack, Larch) (Larix laricina Koch)

PREFERRING cool, swampy situations, though often growing on uplands, it occurs in most parts of the State, more commonly in the northern sections than elsewhere.

In habit it is a tall tree with regular and narrow pyramidal outline. Ultimately it acquires a height of fifty to sixty feet and a diameter of eighteen to twenty inches. The trunk is continuous and tapers rapidly. The branches are slender and horizontal or slightly ascending.



Branchlet and cone. One-half natural size.

The leaves are borne in clusters. They are linear in shape, from three-fourths of an inch to one and a quarter inches in length and bright green in color. In the autumn before they fall they become yellow.

The cones are small, almost globular, nearly threequarters of an inch long and light brown in color. The seeds are small and winged.

The wood is close-grained, heavy, strong and durable. It is used in shipbuilding, and for posts and railroad ties.

While this species is found in moist places, it often does equally well when planted on upland.

SPRUCES

How to know the Spruces

Black Spruce

(Picea mariana B. S. P.)

Leaves

Blue-green and not glossy.

Cones

One-half to one and a half inches in length. Usually remain on the tree for many years.

Red Spruce

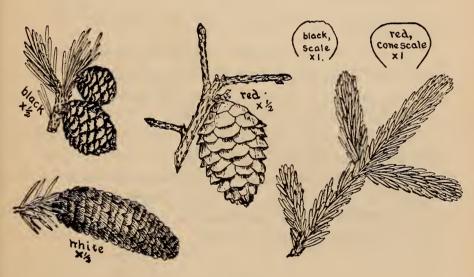
(Picea rubens Sarg.)

Leaves

Dark yellow-green and very glossy.

Cones

One to two inches in length. Usually fall during the first year.



SPRUCES

Branch, cones and cone-scales.

NOTE. — The Norway Spruce, so commonly planted as an ornamental tree and for hedges, is an introduced species. It has a large, slender cone, five to seven inches long, which easily distinguishes it from others. The branches are also more drooping or pendulous.

BLACK SPRUCE (Picea mariana B. S. P.)

THE Black Spruce is a small and rather unimportant tree which is of frequent occurrence in the northern and western sections of the State. Usually it grows in swamps and on the borders of streams, though sometimes on uplands.

In habit it is a conical tree with a height of twenty to thirty feet and a diameter of six to twelve inches. The branches are short, horizontal or slightly declining and tend to turn upwards at the extremities, somewhat after the manner of the Norway Spruce.

The bark on the trunk is grayish-brown and broken into three scales.

The leaves are about one-half inch long and bluegreen in color.

The cones are egg-shaped, one-half to one and one-half inches in length and grayish-brown in color. They usually remain on the trees for several years and often persist for as many as twenty years.

The wood is light, soft and weak. It is seldom used here except for making paper pulp.

Black and Red Spruce have, until recently, been considered the same species, but under the new classification the Black Spruce now becomes a far less valuable tree, commercially, than the Red.



RED SPRUCE (Picea rubens Sarg.)

THIS Spruce is common in the western and northern parts of the State, almost always growing in the well-drained soil of uplands or mountain slopes.

As to habit, its outline is narrowly conical in youth and middle age, and frequently irregular and picturesque in old age. It is a medium-sized tree, commonly reaching a height of forty to fifty feet and acquiring a diameter of one to two feet. The trunk is straight and tapers very slowly. The branches are rather long, frequently slightly pendulous, clothe the stem nearly to the ground and persist for a long time.

The bark is red-brown and broken into irregular scales.

The leaves are about one-half inch in length, dark yellow-green and glossy.

The cones are oblong, one to two inches in length and reddish-brown.

The wood is light, soft and less durable than Pine when exposed to the action of the weather. It is largely used for building-timber and for clapboards and shingles. Owing to the fact that it imparts no flavor, spruce is used in the manufacture of buttertubs and boxes. Great quantities are consumed in the pulp mills.

This species, Professor L. R. Jones of Vermont says, was responsible for the suggestion of the name Green Mountain State to that Commonwealth.

It is not uncommon for lumbermen to designate this species as Black Spruce, but, as this is the only commercial Spruce of importance to Massachusetts, we should readily appropriate the right name, or Red Spruce.



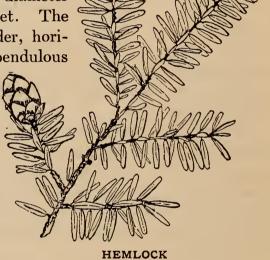
HEMLOCK (Tsuga canadensis Carr.)

THE Hemlock is found in most parts of the State, though it is much more abundant in the western sections. It delights in the moist, cool shade of rocky ridges and river gorges.

In the open, it is a beautiful, pyramidal tree with branches extending quite or almost to the ground. In the forest, it has a tall, gently-tapering trunk which is

surrounded by a rather small, round head. As a rule, it attains a height of fifty or sixty feet and a diameter of two or three feet. The branches are slender, horizontal or slightly pendulous near the ends and persist for a long time.

The bark on the old trunk is cinnamon red or dark gray and divided into narrow, rounded ridges which are covered with scales.



Spray and cone. One-third natural size.

The leaves are from one-third to two-thirds of an inch in length, oblong, dark green and lustrous on the upper surface and whitish beneath.

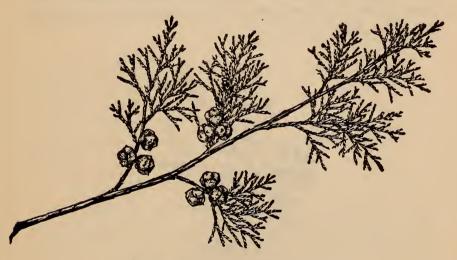
The cones are oblong, about three-fourths of an inch long and light brown in color. The seed is small and winged, maturing in the fall and shedding during the winter.

The wood is very light, soft and brittle. When exposed to the air it perishes quickly. It is sawed into coarse boards and used for cheap building material and sometimes for fuel. The bark is of value for tanning.

WHITE CEDAR (Chamaecyparis thyoides B. S. P.)

THE White Cedar grows almost wholly in swamps, particularly those that are flooded for most of the year. In Massachusetts it occurs in patches of considerable area in the southeastern sections and to a limited extent in other parts.

As to habit, its slender, horizontal branches form a narrow, conical head of neat appearance. The trunk is continuous and attains a height of twenty to forty feet and a diameter of eight to fifteen inches.



WHITE CEDAR. - One-half natural size.

From Sargent's "Manual of the Trees of North America," by permission of Houghton, Mifflin & Co.

On the trunk the bark is reddish-brown and flakes off in thin scales. On old trees, particularly near the base, it is irregularly furrowed.

The leaves are scale-like, not over an eighth of an inch in length and dull blue-green in color.

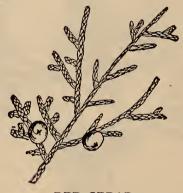
The cones are roundish, about a half-inch in diameter and red-brown at maturity. The seed is small and winged.

The wood is light, soft, weak, very durable and aromatic. It is used for boat-building, interior finishing and for posts. For this last purpose it is particularly desirable.

RED CEDAR (Red Juniper) (Juniperus virginiana L.)

THIS tree receives its popular name, Red Cedar, from the red color of its heart-wood. Growing on dry and gravelly soil and sometimes on rather moist ground, it is common in the eastern sections of the State and of occasional occurrence in the central and western parts.

In habit it is variable. In youth its outline is normally conical, and in old age it is broad and round. The trunk is continuous and attains a height of twenty-five to thirty feet and a diameter of eight to fifteen inches.



RED CEDAR
Two-thirds natural size.

The bark on the trunk is light brown tinged with red. When the tree has acquired age it separates into long, narrow, ribbon-like flakes.

The typical leaves are scale-like, about a sixteenth of an inch in length and dark blue-green in color. On young trees and sometimes on the mature plants, there are needle-shaped leaves about one-half inch in length.

The fruit is berry-like, globular, about the size of a pea and dark blue.

The wood is light, close-grained, not strong, easily worked and durable. It is red in color and pleasantly aromatic. It is used for posts, for pails and in cabinet-making.

WALNUTS*

How to know the Walnuts

Butternut	B	ut	to	er	n	u	t
-----------	---	----	----	----	---	---	---

(Juglans cinerea L.)

Habit

Low, wide-branching, with a broad, round-topped head.

Bark on Trunk

Dark gray and divided into broad, flat ridges.

Teaver

Leaflets 11 to 17 in number.

Fruit

Oblong, cylindrical and covered with sticky hairs.

Black Walnut

(Juglans nigra L.)

Habit

Tall, straight, destitute of branches for a considerable distance from the ground, with a narrow, round-topped head.

Bark on Trunk

Dark brown or almost black and deeply divided into rounded ridges which cross each other obliquely.

Leaves

Leaflets 15 to 23 in number.

Fruit

Globular, without sticky hairs, and somewhat rough.

The Black Walnut and Butternut are easily cultivated, being grown readily by planting the nuts where they are to remain. Seedlings can also be transplanted, but care must be exercised, as they have a pronounced tap-root. The Black Walnut makes a valuable forest tree, and both species make good shade trees and are also valuable for their nuts.



^{*} The true Walnuts. New England people use this name commonly for the Hickories. (See Hickories.)

BUTTERNUT (Juglans cinerea L.)

GROWING in rich, moist soil near streams and on low, rocky hills, the Butternut occurs throughout Massachusetts, though most abundantly in the eastern and central portions.

It is a low, broad-headed tree, usually rising to a height of thirty to forty feet with a trunk diameter of

one to four feet. It branches a few feet from the ground, sending out long, rather stout, horizontal limbs.

The bark on the trunk is dark gray and divided into broad, flat ridges. The leaves



BUTTERNUT

Leaf and fruit. One-third natural size.

BUTTERNUT
Winter twig.
One-half
natural size.

are alternate, from fifteen to thirty inches long and have from eleven to seventeen leaflets. The nuts, which are borne in drooping clusters, are oblong-cylindrical in shape, about three inches long and covered with sticky hairs.

The wood is light, soft and weak. It is employed for the interior finish of houses and used in the manufacture of furniture.

BLACK WALNUT (Juglans nigra L.)

THE Black Walnut is rather rare in Massachusetts, though it occurs more frequently in the western

part of the State than in the eastern. When found, it is usually growing in rich bottomlands or on fertile hillsides.

It is a large tree of upright growth and narrow, round head, which normally attains a height of fifty to seventy-five feet and a trunk diameter of two to five feet. The branches are stout and rigid and the lower ones extend horizontally.

The bark on the trunk is blackish and deeply divided into rounded ridges which have a tendency to cross each other obliquely.

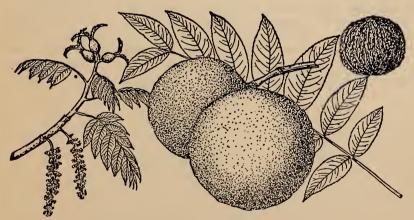
The leaves are alternate, from one to two feet long and have from fifteen to twenty-three leaflets.

The fruit is a globose nut, about two inches in diameter, with a slightly roughened surface.

The wood is heavy, hard, strong, durable and capable of taking a fine polish. It is very valuable for cabinet-making and the interior finish of houses. The older the tree, generally speaking, the darker and more valuable is the wood.



BLACK
WALNUT
Winter twig
and buds.
One-halfnatural size.



BLACK WALNUT .- One-half natural size.

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HICKORIES

How to know the Hickories

Bitternut	Shagbark	Mocker Nut	Pignut
(<i>Hicoria minima</i> Britton)	(<i>Hicoria ovata</i> Britton)	(<i>Hicoria alba</i> Britton)	(<i>Hicoria glabra</i> Britton)
Bark on Trunk	Bark on Trunk	Bark on Trunk	Bark on Trunk
Less rough than in the other species. Light granite-gray tinged with faint yellow and broken into thin, plate-like scales.	Rougher than in other species. Light gray and separates into long, thick plates which are only slightly attached to the tree.	Dark gray, with numerous ridges and without flaking plates.	Dark gray. Comparatively smooth. Often broken into plates.
Leaves	Leaves	Leaves	Leaves
Leaflets 7 to 11 in number.	Leaflets usually 5, rarely 7.	Leaflets 7 or 9 in number.	Leaflets 3, 5 or 7 in number.
Winter Buds	Winter Buds	Winter Buds	Winter Buds
Covered with two pairs of scales and bright yellow.	Terminal bud eggshaped. Outer scales are dark reddish-brown with long, narrow tips and persist until spring.	Terminal buds broadly egg-shaped. Outer scales are dark reddish-brown and fall in autumn. Inner scales light green.	Terminal buds elliptical. Outer scales are dark reddish-brown and usually fall in the autumn. Inner scales yellowgreen.
Twigs	Twigs	Twigs	Twigs
Smooth,	Smooth or coated with soft hairs.	Stout and covered with a woolly growth.	Smooth.
Fruit	Fruit	Fruit	Fruit
Husk thin. Nut thin-shelled and ker- nel bitter.	Husk thick and deeply channeled at the seams. Shell usually thick and the kernel sweet.	Husk thick and strong-scented. The shell thick and the kernel small and sweet.	Husk usually thin. The shell either thick or thin and the kernel sweet or bitter.

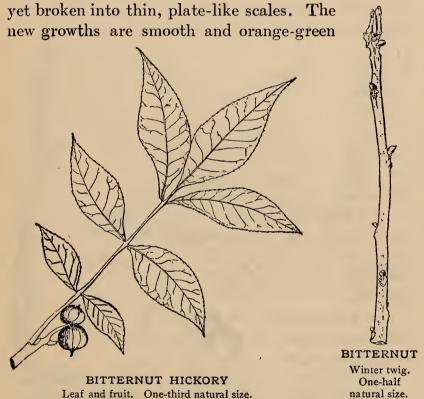


BITTERNUT (Hicoria minima Britton)

NHABITING wet woods near streams and sometimes hilly slopes, the Bitternut is common in most sections of Massachusetts.

Like most of the genus, its trunk tapers gradually to the point of branching and develops a tall cylindrical head with a breadth of twenty to thirty feet. Commonly it grows to a height of fifty feet and has a trunk diameter of one to two feet.

The bark on the trunk is granite-gray faintly tinged with yellow and less rough than in most of the species,



in color. The winter buds are bright yellow, quite different from those of its relatives.

The leaves are alternate, compound, from six to ten inches long and composed of from seven to eleven leaflets. The individual leaflets are smaller and more slender than in the case of the other species. The fruit is about one inch long and thin-husked, while the nut is usually thin-shelled and brittle and the kernel very bitter. The wood is heavy, hard and strong. It is used in making hoops and ox-yokes and for fuel.

SHAGBARK (Hicoria ovata Britton)

GROWING in rich, deep soil near streams and on fertile hillsides, the Shagbark is of common occurrence throughout the State.

The tallest of the Hickories, it has the characteristic habit of the group, a tapering trunk destitute of branches for a considerable distance and a cylindrical head of relatively narrow spread. Usually it attains a height of fifty to seventy-five feet and a trunk diameter not exceeding two feet.

The bark on the trunk is light gray, separating into thick plates often a foot long. When these are only slightly attached, they give to the trunk a shaggy appearance in which is the significance of the popular t e r m Shagbark Hickory. The leaves are alternate, compound, from eight

alternate, compound, from eight to fifteen inches long and composed of five,

SHAGBARK HICKORY
Leaf and young fruit. One-third
natural size.

SHAGBARK Winter twig. One-half size.

rarely seven leaflets. The fruit is borne singly or in pairs and is globular. The husk is deeply grooved at the seams. The kernel is sweet.

The wood is heavy, hard, tough and very strong. It is used largely in the manufacture of agricultural implements and in the building of carriages and wagons. For fuel it is the most satisfactory of our native trees. The nut is a valued article of commerce.

MOCKER NUT (Hicoria alba Britton)

THE Mocker Nut — probably so called because of the size of the nut and the smallness of the kernel

— is distributed throughout the State and is common in the eastern sections. It grows in various soils, on ridges, rocky slopes and in rich bottom-lands.

In habit it is very similar to the Shagbark. It is a tall tree, fifty to sixty feet in height and one to two and one-half feet in diameter.

The bark is dark gray, much like that of the Pignut, yet with much more numerous ridges and without the flaking plates. The recent shoots are short, stout and more or less covered with a downy growth.

The leaves are alternate, compound, eight to ten inches in length and composed of seven to nine leaflets.

The fruit is borne singly or in twos and ripens in October. It is variable in size and shape. Usually it is globose and has a strong-scented husk. The nut is thickshelled and the kernel small and sweet.

The wood is heavy, hard, tough and One-half natural strong. It serves for the same purposes as does that of the Shagbark and is only slightly inferior.



MOCKER NUT .- One-half natural size.

From Sargent's "Manual of the Trees of North America," by permission of Houghton, Mifflin & Co.

PIGNUT (Hicoria glabra Britton)

THE Pignut is abundantly distributed throughout Massachusetts. It seems to prefer the dry ridges and hillsides and is usually in the company of other trees.

Naturally a tall tree, its height seldom exceeds fifty to sixty feet and its diameter is from one to two feet. It has a tapering trunk and a cylindrical head of relatively narrow spread. The bark on the trunk is dark grav.

On old trunks it is comparatively smooth, though often it is broken with plates, somewhat after the manner of the Shagbark.

The leaves are alternate, compound, eight to twelve inches long and composed of five to seven leaflets. The individual leaflets are rather small and narrow.



PIGNUT
Winter twig.
One-half natural size.

Leaf and fruit. One-third natural size.

The fruit, which ripens in October, is borne singly or in pairs and is very variable in shape. Sometimes it is pear-shaped, sometimes round; at other times it is egg-shaped. The fruit is usually small and the husk thin. The wood is heavy, hard, strong, tough and flexible. It is employed in the manufacture of wagons, agricultural implements and tool handles.

POPLARS

How to know the Poplars

Aspen (American)

(Populus tremuloides Michx.)

Leaves

Roundish. Margin finely toothed. Upper surface lustrous.

Winter Buds

Conical, lustrous and somewhat sticky.

Bark

Very bitter.

Largetooth Aspen

(Populus grandidentata Michx.)

Leaves

Broadly egg-shaped. Margin coarsely scalloped. Upper surface not lustrous.

Winter Buds

Broadly egg-shaped. Not sticky and covered with whitish, matted hairs.

Bark

Not bitter.

NOTE. — Introduced species. — In addition to these native Poplars, two European species are very commonly planted — the Lombardy Poplar (P. nigra Italica), recognized by its tall, spire-like form, and the White Poplar (P. alba), easily distinguished by its leaves, green above and very white-cottony beneath.

The Poplars belong to the Willow family and resemble the Willows, especially in flower and fruit characters. The nodding, worm-like, staminate and pistillate catkins are borne upon different trees and, opening before the leaves, are conspicuous in early spring. The Poplars are quite widely distributed, extending from the Arctic circle to Mexico and from the Atlantic to the Pacific.

The wood of Poplars is very soft and light and especially liable to warp, but is cheap and useful for making toys, boxes and smaller furniture. Much of it now goes to the pulp mills.

The Poplars, like the Willows, can be propagated easily from cuttings.



ASPEN (American) (Populus tremuloides Michx.)

THE Aspen is a rapid-growing tree common to all parts of Massachusetts, thriving in many soils and situations but preferring a moist, somewhat sandy soil. It is frequently the first tree to take possession where forests have been burned or cut off.

Here it is a small, graceful tree, seldom exceeding a height of thirty to forty feet and a diameter of eight to fifteen inches. The branches are slender, extend at right angles to the stem, are slightly pendulous toward the ends and form a narrow, round head.

The bark is smooth and pale green, marked with patches of dark brown. On the old trunk it is ashgray, although at the base of the tree it is almost



AMERICAN ASPEN

Leaves and flowers; 1 staminate, 2 pistillate. One-third natural size.

black and conspicuously ridged. The bark is very bitter and has a taste similar to that of quinine.

The leaves are simple, alternate, roundish, about two inches in length, finely toothed, and dark green and lustrous on the upper surface. The leaf stalk is flattened at right angles to the blade of the leaf.

The flowers are in catkins and appear in April before the leaves.

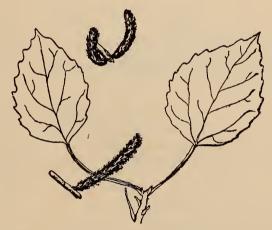
The wood is soft, weak and very perishable when exposed to the weather. It is of little value although it is used to a certain extent in the making of paper pulp, box-boards and occasionally for fuel.

LARGETOOTH ASPEN (Populus grandidenta Michx.)

THE Largetooth Aspen is of common occurrence throughout the State, growing in various soils and situations, but preferring rich, sandy soil in the vicinity of streams and swamps.

It is a quick-growing tree, very similar in habit to the Aspen. Naturally it attains a height of thirty to forty feet and a trunk diameter of twelve to twenty inches.

The bark is smooth and greenish-gray in color. On old trees it is somewhat darker and divided into broad, flat ridges.



LARGETOOTH ASPEN

Leaves and flowers; pistillate above, staminate below.

One-third natural size.

The leaves are simple, alternate, broadly egg-shaped, three to four inches in length, coarsely scalloped on the margins and dark green on the upper surface. The leaf stalk is flattened at right angles to the blade of the leaf.

The flowers are in catkins and appear in March or April, before the leaves.

The wood is similar to that of the preceding, being light, soft and of little value. It is used for paper pulp, box-boards and sometimes for fuel.

BIRCHES

How to know the Birches

Gray Birch (Betula populifolia Marsh.)	Paper or White Birch (Betula papyrifera Marsh.)	Yellow Birch (Betula lutea Michx. f.)	Sweet or Black Birch (Betula lenta L.)
Bark	Bark	Bark	Bark
Grayish-white and chalky on the outer surface and orange on the inner. Does not separate into papery layers.	Creamy-white and lustrous on the outer surface and orange on the inner. Separates readily into thin layers.	Silvery-gray or light orange in color. Separates into thin, persistent layers: On young branches aromatic.	Dark, almost black and without lustre. Broken into large, irregular plates. Onyoung branches aromatic.
Leaves	Leaves	Leaves	Leaves
Triangular, long- pointed and coarsely doubly toothed. Lustrous on upper surface.	Egg-shaped and not long-pointed. Usu- ally doubly toothed. Not lustrous.	Egg-shaped to oblong. Sharply doubly toothed.	Egg-shaped to oblong. Sharply toothed.
Flowers	Flowers	Flowers	Flowers
Winter catkins borne singly or in pairs.	Winter catkins borne in clusters of three.	Winter catkins not clustered. Three to four on a shoot.	Winter catkins not clustered. Three to four on a shoot.

Note. — The European White Birch (B. alba), an introduced species, is commonly planted for ornamental purposes. It is a beautiful tree, closely resembling the native White Birch. There are numerous horticultural varieties, some with finely-cut leaves and pendulous branches.

The wood of Birches is valued chiefly for cabinet-making, for spools and other small articles

Birches yield quantities of seed and are extremely valuable in reseeding waste and barren lands, and rendering the conditions favorable to White Pine coming in. The White Pine then replaces them in clean stands.

When young, the saplings of all the species look more or less alike.



GRAY BIRCH (Betula populifolia Marsh.)

HE Gray Birch grows abundantly in all parts of the State, thriving on the poorest sandy soils, yet by no means limiting itself to such unfavorable situations. This is the tree that is usually the first to take possession of fields or pastures that have gone into disuse, mingling with other plants of similar desires

or taking possession of many areas by itself.

As commonly found, it is a small, slender, pyramidal tree, from twenty to twenty-five feet in height. The trunk

as a rule ascends obliquely. Branches are short, slender and often pendulous and clothe the trunk to theground.



The whole appearance of the tree is light and airy. The bark on the trunk is grayishwhite and chalky on the outer surface and orange on the inner. Unlike some of the other birches, its bark does not easily separate into layers. The branches are blackish and the young shoots are brown. The leaves are simple, alternate, triangular, GRAY BIRCH

long-pointed, two and one-half to four inches in length, coarsely toothed and dark green and glossy on the upper surface.

and buds

The flowers are in catkins. The sterile ones appear in the fall and are usually solitary.

The wood is light, soft and not durable. It is used in the manufacture of spools and shoe pegs and is useful for summer fuel. The tree is chiefly valuable for the rapidity with which it grows on poor soil.

PAPER OR WHITE BIRCH (Betula papyrifera Marsh.)

N Massachusetts the Paper Birch, so called because of the use to which the early settlers put the bark, grows commonly in the middle and western parts of the State and is very infrequent in the eastern sections. Wherever found, its favorite home is the vicinity of

streams and swamps and the damp, wooded slopes.

In habit it is a pyramidal tree of graceful appearance, commonly attaining a height of about

WHITE OR PAPER BIRCH Leaves and fruit. One-third natural size.

One-half

fifty feet and a diameter of one to two feet. The trunk is usually continuous, though it

may sometimes divide, and the slender branches are horizontal or slightly pendulous. When old or crowded, the Paper Birch loses its lower branches and assumes a small, round head. The bark on the trunk is white and lustrous on the outer surface and orange on the inner. It separates freely into thin, papery scales. The leaves are simple, alternate, egg-shaped, apex not long-pointed, OR PAPE three to four inches long, doubly toothed and Winter twig dark, lustreless green on the upper surface. The flowers are borne in catkins. The sterile

catkins which appear in the fall are mostly in clusters of three. The wood is light, strong and hard. It is used for spools, shoe lasts, pegs, in the making of paper pulp and for fuel.

YELLOW BIRCH (Betula lutea Michx. f.)

THIS Birch is common throughout Massachusetts, inhabiting the low, rich woods and hillsides or mountain slopes.

It is the largest of the native birches and often attains a height of fifty to sixty feet and a trunk

diameter of two to three feet. Usually the trunk divides at a considerable distance from the ground, continuing in two or three large limbs. The branches are numerous and slender. In the woods the head is small and irregular, while in the open it is broad and round.

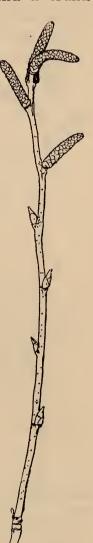
The bark on the trunk is silvery-gray or light orange in color and separates into thin, persistent layers. On very old trees the trunk is rough, gray or blackish and without lustre. The young twigs are light brown, lustrous and aromatic, but to a less degree than those of the Sweet Birch.

The leaves are simple, alternate, eggshaped or approximately oblong, doubly toothed, three to five inches long and dark green and lustreless on the upper surface.

The flowers are in catkins. The winter catkins are three to four in number and not in clusters.

The wood is heavy, strong, hard and flexible. It is used in the making of furniture, in the building of carriages, for flooring and for fuel.

When this species is in clear stands it should be thinned as soon as it gets large enough for use, as it is attacked Winter twig. Oneby a fungus which depreciates the value of the stand for future results. This species takes on a deep bronze when very old.



YELLOW BIRCH

SWEET OR BLACK BIRCH (Betula lenta L.)

THE Sweet Birch is of frequent occurrence throughout the State, though it rarely grows in the vicinity of the coast. Its favorite habitat is the rich, moist soil of woods or the banks of streams.

As commonly found, it is a medium-sized tree, having a height of about fifty feet and a trunk dia-

meter of one to two feet, although specimens may exceed these dimensions. The trunk is upright and the branches

SWEET OR BLACK BIRCH

SWEET OR BLACK BIRCH

Leaves and fruit.
One-third natural size.

are slender, extending almost horizontally, with the lower ones often somewhat pendulous. In the open the tree develops a symmetrical, round head.

The bark on the trunk is dark, almost black, dull and broken into large, irregular plates. On old trunks it very much resembles that of the Sweet Cherry, wherefore the term Cherry Birch is often applied to the tree. The young shoots are dark brown, lustrous and very aromatic. It is this last characteristic which justifies the name Sweet Birch.

Winter twig. Onehalf natural size.

The leaves are simple, alternate, egg-shaped or approaching oblong, three to four inches long, sharply toothed and dark green and dull on the upper surface.

The flowers are in catkins. Of the winter ones there are three or four on a shoot.

The wood is heavy, very strong, hard, durable and easily wrought. It is used largely in the making of furniture and is highly esteemed for fuel.

HOP-HORNBEAM OR IRONWOOD

(Ostrya virginiana Koch.)

THE Hornbeam, so called because of its general resemblance to the European Hornbeam, is a small, slender, round-topped tree, usually not more than twenty to thirty feet tall and eight to twelve inches through. Its branches are long, slender and somewhat drooping at the ends. It occurs commonly throughout the State, growing on gravelly and rocky

slopes, often in rather open woods.

The bark on the trunk is light brown tinged with red and breaks into fine scales. These separate easily, are narrower than the scales of any rough-barked tree and become finer and narrower as the tree grows older.

The leaves are simple, alternate, egg-shaped or nearly oblong, sharply

HORNBEAM OR IRONWOOD
Leaves and fruit. One-third natural size.

toothed, two to three inches long and very similar to those of the Blue Beech.

The flowers are borne in catkins, the sterile ones appearing in the fall, usually in clusters of three, and the fertile ones appearing in the spring.

The fruit, which ripens in September, very closely resembles a cluster of hops.

The wood is compact, close-grained, strong, tough, durable and very heavy. It is good for levers, stakes, binding poles, handles, mallets and the like.

BLUE BEECH OR HORNBEAM (Water Beech)

(Carpinus caroliniana Walt.)

NHABITING wet woods and the border of swamps and streams, the Blue Beech is of common occurrence throughout the State, though less frequent near the coast than inland. It is a slow-growing, small tree, ten to thirty feet high, with a short trunk not more than six to twelve inches in diameter. The

branches are irregular and crooked and extend at varying angles. The head is compact, broad and flat or somewhat roundish. The trunk is

marked with irregular, longitudinal ridges. Its bark is smooth like that of the Beech and of a bluish-gray color.

Leaves and fruit. One-third natural size.

Son it is called the Blue Beech. The leaves are simple, alternate, egg-shaped or oval, sharply and irregularly toothed, two to three inches in

and irregularly toothed, two to three inches in length and very similar to those of the Sweet Birch, though the aromatic flavor is wanting. The flowers are borne in

catkins. Both the fertile and the sterile ones appear in the spring.

BLUE BEECH

Winter twig. One-half natural size.

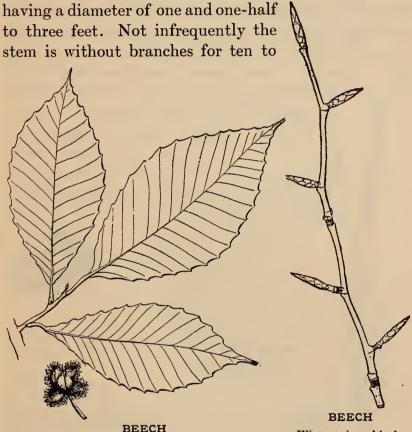
In the fruit, the leaf-like body which subtends the nutlet is three-lobed and not inflated, differing in this respect from the fruit of the Hornbeam.

The wood is compact, close-grained, tough, durable and very strong. It is sometimes used for levers, beetles and the handles of tools.

BEECH (Fagus atropunicea Sudworth)

THE Beech is of common occurrence throughout the State, yet it is more abundant in the western sections than the eastern. Its home is on cool rocky slopes.

In habit it is a spreading tree with a broad and dense head, usually growing from fifty to sixty feet high and



Leaves and fruit. One-third natural size.

Winter twig and buds. One-half natural size.

twenty feet. The bark on the trunk is smooth and bluegray in color. It is not to be mistaken for that of any other native tree, except possibly that of the Blue Beech.

The winter buds are long and slender and taper slowly to a sharp point. The leaves are simple, alternate, oval, from three to five inches in length, coarsely serrate and green on both surfaces. The fruit is a four-valved, prickly bur which encloses a triangular nut. Its wood is hard, strong, tough, perishable and liable to warp. It is employed in the manufacture of some kinds of furniture, for shoe lasts, for the handles of tools and for fuel.

CHESTNUT (Castanea dentata Borkh.)

HE Chestnut is found commonly throughout Massachusetts, though less frequently near the sea-coast than inland. Its habitat is rich, well-drained soil. A rapid grower and one of the tallest and straightest of our trees, it usually has a single trunk destitute of limbs for a considerable distance and a rather small, round head. However, when it is uncrowded, the trunk often separates into several stout branches which form

> a low, round head of great breadth. In the former case it often attains a height of sixty to eighty feet and has a diameter of three to four feet. Most frequently it is met with

in the coppice form, for it is one of the trees most freely reproduced from

CHESTNUT Leaf and fruit. One-third natural size.

CHESTNUT

Winter twig and buds. One-half natural size.

sprouts. In this case it has a height of thirty to forty feet and a diameter of eight to fifteen inches.

The bark on the trunk of a small tree is dark gray and smooth. On the old trunk it is thick and divided by shallow furrows into broad, flat ridges. On the twigs the bark is dark brown. The leaves are simple, alternate, five to ten inches in length, sharply toothed and dark yellow-green in color. The fruit is a round, four-valved, prickly bur and contains, as a rule, two to three dark brown nuts. The wood is coarse-grained, light, soft, weak, but durable when exposed to alternations of dryness and moisture. It is used in the making of furniture, for house finishing, for railway ties, fence-posts and for fuel.

OAKS

How to know the Oaks

Chestnut Oak

(Quercus prinus L.)

Bark

Swamp White Oak

(Quercus platanoides Sud.)

Bark

White Oak

(Quercus alba L.)

Bark

Light ashen-gray and broken into thin, irregular flakes.	Dark brown or almost black and divided into broad, rounded ridges.	Grayish-brown and deeply and irregularly divided into broad, flat ridges.
Leaves	Leaves	Leaves
With rounded lobes.	Not lobed but coarsely and irregularly scalloped.	Scalloped or slightly lobed.
Fruit	Fruit	Fruit
Matures first year.	Matures first year.	Matures first year.
Winter Buds	Winter Buds	Winter Buds
Broadly egg-shaped, acute or obtuse at apex, and red-brown.	Egg-shaped, rather long- pointed and chestnut- brown.	Roundish, obtuse at apex, and brown.
Red Oak	Scarlet Oak	Yellow Oak
(Que r cus rubra L.)	(Quercus coccinea Muenchh)	(Quercus velutina Lam.)
Bark	Bark	Bark
Dark gray or almost black	Dark gray and broken	Dark, almost black, and
and coarsely and irregu-	into small, irregular	deeply divided into broad,
and coarsely and irregularly ridged, yet never extremely rough. Inner bark reddish.	into small, irregular ridges. Inner bark red- dish.	deeply divided into broad, rounded ridges. Inner bark often yellow.
larly ridged, yet never extremely rough. Inner bark	ridges. Inner bark red-	rounded ridges. Inner
larly ridged, yet never extremely rough. Inner bark reddish.	ridges. Inner bark red- dish.	rounded ridges. Inner bark often yellow.
larly ridged, yet never extremely rough. Inner bark reddish. Leaves	ridges. Inner bark red- dish. Leaves	rounded ridges. Inner bark often yellow. Leaves
larly ridged, yet never extremely rough. Inner bark reddish. Leaves Lobes with sharp tips. Upper surface with out	ridges. Inner bark red- dish. Leaves Lobes with sharp tips.	rounded ridges. Inner bark often yellow. Leaves Lobes with sharp tips.
larly ridged, yet never extremely rough. Inner bark reddish. Leaves Lobes with sharp tips. Upper surface with out lustre.	Leaves Lobes with sharp tips. Upper surface lustrous.	rounded ridges. Inner bark often yellow. Leaves Lobes with sharp tips. Upper surface lustrous.
larly ridged, yet never extremely rough. Inner bark reddish. Leaves Lobes with sharp tips. Upper surface without lustre. Fruit	Leaves Lobes with sharp tips. Upper surface lustrous. Fruit	rounded ridges. Inner bark often yellow. Leaves Lobes with sharp tips. Upper surface lustrous. Fruit
larly ridged, yet never extremely rough. Inner bark reddish. Leaves Lobes with sharp tips. Upper surface without lustre. Fruit Matures second year.	Leaves Lobes with sharp tips. Upper surface lustrous. Fruit Matures second year.	rounded ridges. Inner bark often yellow. Leaves Lobes with sharp tips. Upper surface lustrous. Fruit Matures second year.

WHITE OAK (Quercus alba L.)

THE White Oak, which receives this appellation because of the light color of the bark on the trunk, grows very commonly in Massachusetts, though it is perhaps less abundant in the western sections than elsewhere. It occurs in a variety of soils and situations, usually on the lighter ground of the uplands, yet sometimes on moist land.

WHITE OAK

Leaves and fruit.

One-third natural size.

A tall tree, commonly developing a height of fifty to seventy-five feet and a trunk diameter of three to four feet, it shows a considerable diversity of habit. In the woods it has a tall, single stem, with a narrow head. In the open the bole is short and the large, diverging

limbs, many of them nearly horizontal, form a broad, round-topped head.

The bark on the trunk is light ashengray and broken into thin, irregular flakes.

The leaves are simple, alternate, from four to seven inches in length and usually divided into seven lobes. The upper surface of the leaf is bright green and the lower, pale green or whitish. In the autumn the foliage turns to a deep wine-red. Not infrequently it remains on the tree during the winter. The flowers appear in May when the leaves are half grown. The fruit

WHITE OAK
Winter twig
and buds.
One-half
natural size.

matures the first season and ripens in September. The acorn is about three-fourths of an inch in length, light chestnut-brown and enclosed for about one-fourth its length in the cup. Its wood is the most valuable of the native trees. It is hard, heavy, tough, close-grained and durable. It is employed for ship-timber, carriage-making, agricultural implements and for furniture and interior finishing. The bark is valuable for tanning.

CHESTNUT OAK (Quercus prinus L.)

THIS tree derives the justification for its common name, Chestnut Oak, from the resemblance which its leaves bear to those of the Chestnut. It occurs in the eastern parts of Massachusetts, sometimes rather frequent locally, as in the Blue Hills. Usually it may be found in rich, moist soil on rocky slopes and banks.

Here it is a small or medium tree, twenty-five to forty feet in height with a trunk diameter of one to one and one-half feet. Nevertheless it may sometimes assume greater dimensions. In the former case the trunk is usually continuous. The branches are small and form a narrow, round head.

The bark on the old trunk is dark reddish-brown or almost black and divided into broad, rounded ridges which have small surface scales.

The leaves are simple, alternate, five or six inches long, oblong or lanceshaped, coarsely and irregularly scalloped, and vellowish-green and lustrous on the upper surface.

The flowers appear in May when CHESTNUT OAK the leaves are partially grown.

The fruit matures the first year. The acorns are about an inch long, light brown in color and slightly or almost half enclosed by the cup.

The wood is heavy, hard, strong and durable when in contact with the soil. It is employed for fencing, for railroad ties and for fuel. The bark is used in tanning. Chestnut Oak is considered to be equal in value to the White Oak.



SWAMP WHITE OAK (Quercus platanoides Sud.)

THIS species gets its popular designation, Swamp White Oak, from its resemblance to the White Oak and its frequent fondness for swampy situations. Growing in rich soil along streams and swamps, it occurs throughout the State and is rather common in some of the eastern sections. In habit it bears a general likeness to the White Oak, though its branches

are not so spreading and its head is less regular and narrower. Ordinarily its height is from forty to fifty feet and its diameter is

from two to three feet.

The bark on the trunk is grayish-brown and deeply and irregularly divided into broad, flat ridges. The bark of the White Oak is somewhat lighter and the scales finer. On the young branches the scales hang loosely, giving a marked appearance to the tree.

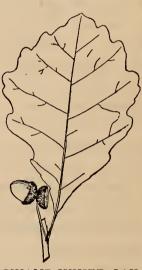
The leaves are simple, alternate, obovate or oblong, four to six inches long, scalloped or slightly

lobed and dark, lustrous green on the upper surface.

The flowers appear in May when the leaves are partially grown.

The fruit ripens the first season. The acorn is about one inch long, light chestnut-brown in color and enclosed in the cup for about one-third its length.

Its wood is very similar to that of the White Oak and only slightly inferior in quality. It is used in construction, in carriage-building, for interior finishing, for furniture and for fuel.



SWAMP WHITE OAK
Leaf and fruit. One-third
natural size.

SWAMP WHITE OAK

Winter twig and buds. One-half natural size.

RED OAK (Quercus rubra L.)

THE Red Oak is very abundantly distributed throughout Massachusetts. It occurs in various soils and in various situations, excepting, however, wet land.

One of the most rapid-growing of the Oaks and the largest of the native species, it attains a height of sixty to seventy feet and a diameter of three to four feet. Frequently a specimen exceeds these dimensions. Normally the trunk is continuous. The branches are

> stout, upright or horizontal, develop higher up on the trunk than do those of the White Oak

> > and form a narrow or sometimes broad head.

The bark on the young tree is smooth and gray. On the old it is dark gray or almost black and ridged coarsely and irregularly, yet never becoming extremely rough. The leaves are simple, alternate, five to eight inches in length and variable in outline.



RED OAK Winter twig and buds. One-half natural size.

Frequently they are oblong and show seven to nine lobes. The upper surface is a dull, dark green and the lower surface is vellowish-green.

The flowers, the earliest of the Oaks, appear in late April or early May when the leaves are partially The fruit matures the second season. The acorn is from three-fourths to one and one-fourth inches in length and is larger than that of any other native Oak. The wood is heavy, hard and strong. is less valuable than that of most of the Oaks, though it is used for furniture and interior finishing. For fuel it is held in little esteem.

SCARLET OAK (Quercus coccinea Muenchh)

THE deep scarlet which the leaves assume in the autumn is responsible for the popular name which the tree possesses. Normally growing on dry soil, it occurs abundantly in the eastern sections of Massachusetts, frequently in the central portion and only rarely in the western.

As to habit, it is usually a medium-sized tree, thirty to fifty feet in height and one to two feet in

diameter. The trunk is straight and tapering. The branches are slender, horizontal and drooping towards the ends. The head is rather narrow and open.

The bark on the old trunk is dark gray and broken by shallow fissures into irregular ridges. The inner bark is reddish.

The leaves are simple, alternate, three to six inches in length, variable in outline but usually oblong or egg-shaped, divided into seven or sometimes nine lobes and bright, lustrous green on the upper surface.

The flowers appear in May when the leaves are about half grown.

The fruit matures the second season. The acorn is about one-half inch long, bright reddish-brown, often striped and enclosed in the cup for about one-half its length.

The wood is heavy, hard and strong. In value it ranks a little lower than that of the Red Oak and serves to a limited extent for the same purposes.

Chiefly because of its beautiful autumnal coloring it is rather commonly planted for ornamental purposes.



SCARLET OAK Winter twig and buds. One-half natural size.

YELLOW OAK (Quercus velutina Lam.)

THE Yellow Oak, or, as it is more frequently called, the Black Oak, occurs in all parts of Massachusetts and is really abundant in the eastern sections. Its usual home is on poor soil, particularly on gravelly uplands and ridges.

As to habit, it is intermediate between the Red Oak and the Scarlet Oak. The trunk commonly attains a height of fifty to sixty feet and a diameter of two to three feet. The branches are stouter than those of



Leaf and fruit. One-third natural size.

the Scarlet Oak, yet not so stout as those of the Red. The head is narrow and roundish.

The bark on young stems is smooth and dark gray or brown. On old trunks it is dark, almost black, and is deeply divided into broad, rounded ridges. In this last respect it differs from the Red Oak, the bark of which has flat ridges and is never quite so rough.

The winter buds are large, strongly angled and covered with a matted, woolly growth.

The leaves are very variable, sometimes resembling those of the Scarlet and sometimes those of the Red Oak. They are simple, alternate, egg-shaped or ob-

Yellow Oak - Concluded

long, mostly seven-lobed, sometimes divided nearly to the midrib and again nearly entire, and dark green and glossy on the upper surface.

The flowers appear in the early part of May when the leaves are nearly half grown.

The fruit matures the second year. The acorn is one-half to three-fourths of an inch long, light redbrown, often marked with lines of a darker color and enclosed in the cup for about one-half its length.

The wood is heavy, hard, coarse-grained and strong. It has little use except for fuel. The bark is used in tanning and in medicine.



YELLOW OAK

Winter twig and buds. One-half natural size.

ELMS

How to know the Elms

Slippery Elm	White Elm	
(Ulmus pubescens Walt.)	(Ulmus americana L.)	
Habit	Habit	
Medium height. Head broad and almost flat.	Tall and variable in outline, yet typically vase-shape.	
Bark on Trunk	Bark on Trunk	
Dark brown tinged with red. Inner bark mucilaginous.	Ashy-gray. Inner bark not mucilaginous.	
Leaves	Leaves	
Very rough on the upper surface and nearly as rough on the lower.	Somewhat rough on the upper surface and smooth on the lower.	
Winter Buds	Winter Buds	
Dark brown and covered with rusty hairs.	Brown and smooth.	



SLIPPERY ELM (Ulmus pubescens Walt.)

THE Slippery Elm, a common name attached to this species because of the mucilaginous inner-bark, is very rare or wanting in the eastern sections of the State, but is rather frequent in the western parts. It has a

preference for low, rich soil, though it some-

times occurs on higher ground.

In habit it is a lower tree than the American Elm and, in proportion to its height, more spreading. It is a medium-sized tree, attaining a height of forty to fifty feet and a trunk diameter of one to two feet. The head is very broad and almost flat.

The bark on the trunk is thick, dark brown tinged with red, divided by shallow fissures into flat ridges and covered with

flat scales.

The winter buds are obtuse, dark brown in color and covered with rusty hairs.

The leaves are simple, alternate, four to six inches long, sharply doubly toothed, dark green and very rough on the upper surface and rough on the under-surface.



SLIPPERY ELM

Leaves and fruit. One-third

natural size.

SLIPPERY ELM Winter twig and buds. One-half natural size.

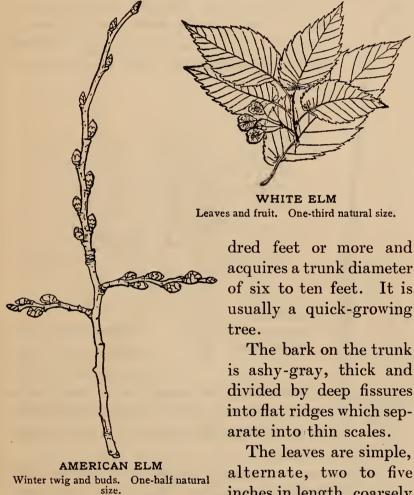
The flowers appear before the leaves about the middle of April and the small fruit ripens in late spring.

The wood is very similar to that of the American Elm, being heavy, strong and durable. It is employed in the manufacture of agricultural implements, for the hubs of wheels, in the construction of vessels and for fence-posts.

WHITE OR AMERICAN ELM (Ulmus Americana L.)

THE American Elm is very common everywhere in Massachusetts and reaches its maximum development in the Connecticut Valley. Its favorite habitat is the moist ground along streams and rich bottom-lands.

Its graceful habit, typically vase-shape, yet often varied, is very familiar. Commonly from fifty to sixty feet in height, it often grows to a height of one hun-



acquires a trunk diameter of six to ten feet. It is usually a quick-growing

The bark on the trunk is ashy-gray, thick and divided by deep fissures into flat ridges which separate into thin scales.

The leaves are simple, alternate, two to five inches in length, coarsely

doubly toothed and dark green and somewhat rough on the upper surface.

The flowers appear in late March or early April before the leaves, and the small, winged fruit ripens in May before the leaves are fully developed.

The wood is heavy, hard, strong and tough. It is employed for the hubs of wheels, in boat and ship building, for flooring and in cooperage.

HACKBERRY (Celtis occidentalis L.)

ROWING in various situations, sometimes in moist, rich ground, yet more frequently on gravelly soil or rocky hillsides, it occurs occasionally throughout the State, nevertheless it is somewhat more abundant in the southeastern sections near the coast. Here it is a slow-growing tree, of medium dimensions, and attains a height of twenty to forty feet and a diameter of eight

to twenty inches. Its habit is somewhat variable. The trunk is short and the branches are stout, spreading and angular. The twigs are extremely slender. The head is low and round.



is gravish and is broken into thin scales. It is often marked with ridges or with varying excrescences. The bark on the season's shoots is reddishand buds. One-

The bark on the

brown.

Winter twig

half natural size.

The leaves are simple, alternate, two to four inches long and variable in outline. They bear some resemblance to the leaf of the American Elm. The flowers are greenish and appear in May with the leaves.

The fruit is a globular drupe about one-fourth of an inch in diameter. The flesh is sweet and the outer surface is purplish-red, changing in winter to brownishorange. The wood is heavy, rather soft, weak and quick to decay. It is employed in making the cheaper grades of furniture.

SASSAFRAS (Sassafras sassafras Karst.)

THE Sassafras occurs in almost every part of Massachusetts. It grows in various soils and situations but prefers a rich, somewhat sandy, well-drained soil. For the most part it is a small tree. Usually its height would not be much above thirty feet and its

diameter much over twelve inches. The stem is rarely erect, and is often bent and crooked. In young trees the branches havea whorled appearance. They



are always short and stout, and frequently

they are contorted. The head is narrow and flat. The bark of the old trunk is thick, dark reddish-brown and strongly ridged.

SASSAFRAS
Winter twig
and buds. Onehalf natural
size.

On young stems the bark is greenish and finely striate. The twigs are yellowish-green and have strong aromatic properties, as does the bark of all the parts.

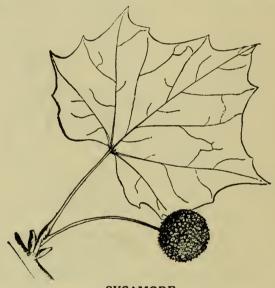
The leaves are simple, alternate and of greatly varying outline. Sometimes they are entire and then again they are three-lobed. In summer the foliage is dark green and in the autumn it turns to yellow or to orange tinged with red. The flowers are small, greenish-yellow and appear in May when the leaves are unfolding.

The fruit is a small, dark blue, lustrous berry which ripens in early fall. The wood is light, soft, brittle and very durable when in contact with the soil. It is used for posts, in construction of light boats and in cooperage. The roots supply the oil of sassafras.

SYCAMORE (Buttonwood) (Platanus occidentalis L.)

THIS, the largest of the New England trees, occurs occasionally throughout the State, frequenting the borders of streams and rich bottom-lands. It grows from fifty to one hundred feet in height and has a trunk diameter of three to eight feet. The trunk may spread near the ground into several large, secondary limbs, or it may rise without branching for a considerable distance and then have large, spreading branches.

The branchlets are very often tufted in appearance, due to the activities of a fungus. The bark on the trunk and large



SYCAMORE
Leaf and fruiting head. One-third natural size.

SYCAMORE Winter twig and buds, One-half natural size. limbs is greenish-gray in color and flakes off in broad scales, exposing the inner bark which is at first whitish or light green, then darker. The leaves are simple, alternate, three to five lobed and light green.

The base of the leaf-stalk is swollen and includes the winter bud. The fruit is in the shape of a ball and is about an inch in diameter. It contains very many small seeds and usually remains on the tree until spring. The wood is hard and firm but very perishable when exposed to the weather, and liable to warp. It is used for tobacco boxes, furniture and interior finish of houses. It is fairly good for fuel.

WILD RED CHERRY (Bird Cherry)

(Prunus pennsylvanica L. f.)

THE Wild Red Cherry is a tree of little value, which often takes possession of areas cleared by fire. It occurs in the State, being more abundant in the central and western sections than elsewhere. While it grows in a variety of situations, it really prefers a moist, rich soil.

In habit it is a small tree, seldom exceeding a height of twenty-five to thirty feet and a diameter of ten inches. The trunk is continuous and the branches slender. The head is narrow and roundish or oblong.



WILD RED CHERRY
Leaves, flowers and fruit. One-third natural size.

The bark on the young trunk is smooth and reddish brown, while in the old it is dark red-brown and broken into thin plates. The inner bark possesses bitter, aromatic properties.

The leaves are simple, alternate, oblong or lanceshape, three to four inches in length, finely toothed on the margin and bright green and lustrous on the upper surface.

The flowers appear in May when the leaves are about half grown. They are white and occur in clusters of four or five.

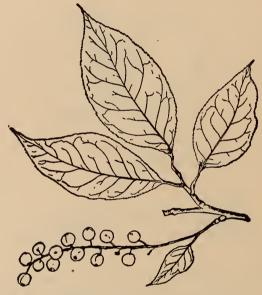
The fruit is globular in shape, a little larger than a pea and bright red.

The wood is light and soft and without economic value.

BLACK CHERRY (Prunus serotina Ehrh.)

FOR the economic value of its wood, the Black Cherry is the most important of the native Cherries. It is of common occurrence in all parts of the State, growing on many soils and in many situations, yet preferring moist, rich ground.

As to habit, though sometimes a mere shrub, it usually reaches a height of thirty to forty feet and acquires a diameter of ten to fifteen inches,—at times even exceeding these dimensions. The trunk is usually continuous and the branches are small and horizontal. The head is narrow and oblong.



BLACK CHERRY
Leaves and fruit. One-third natural size.

The bark on young stems is red-brown and somewhat lustrous. On the old trunk it is darker and broken into small, irregular plates. The inner bark is bitter to the taste.

The leaves are simple, alternate, oblong to lanceoblong in shape, three to five inches in length, the margin notched with fine teeth, somewhat leathery in texture and dark green and lustrous on the upper surface.

The flowers appear in late May or early June, when the leaves are only half grown. They are small, white

BLACK CHERRY — Concluded

and borne in many-flowered racemes which are four to five inches in length.

The fruit is globular, about the size of a pea, dark

purple in color and usually slightly bitter.

The wood is light, close-grained, rather hard, not liable to warp and capable of taking a good polish. It is employed in cabinet-making and for interior finishing.

The fruit and bark possess valuable medicinal properties.



BLACK CHERRY

Winter twig and buds. One-half natural size.

LOCUST (Robima pseudacacia L.)

ALTHOUGH the Locust is not native to the State, it has become so thoroughly naturalized that it is as common as many of the indigenous species. It prefers rich ground, yet it is found in various soils and situations.

When young it is a rapid-growing tree, often attaining a height of twenty feet in half as many years. After that period its increase is much slower. Here it is usually a small tree, from twenty-five to fifty feet in height and from eight inches to two feet in diameter. The trunk is erect or sometimes oblique and irregular. The branches are small and brittle and form a narrow, oblong head.

The bark on the old trunk is dark gray, thick and deeply and irregularly furrowed. The young branches are armed with spines which disappear as the tree ages.

The leaves are pinnately compound and composed of seven to twenty-one leaflets. The individual leaflets are small, about an inch or an inch and a quarter in length and oval in outline.

The flowers, which appear in early June after the leaves unfold, are borne in loose racemes, four to five inches in length. They are creamy-white, showy, fragrant and much frequented by bees.

The fruit is a pod which is smooth, flat, dark brown and about three inches in length.

The wood is heavy, exceedingly hard, strong and very durable when in contact with the soil. It is employed for shipbuilding, for fence-posts, in turnery and for fuel.

MAPLES

How to know the Maples

Striped Maple	Sugar Maple	Silver Maple	Red Maple
(A cer pennsylvani- cum L.)	(Acer saccharum Marsh.)	(A cer saccharinum L.)	(A cer rubrum L.)
Habit	Habit	Habit	Habit
A shrub or small, erect tree. Trunk continuous.	When young the outline is usually narrowly egg-shaped. Later it may become roundish. Trunk continuous.	Normally, trunk separates at a few feet from ground into three or four upright stems. Branches slender and often pendulous.	Trunk upright and usually continuous. Occasionally it divides into 2 or 3 upright stems. Head narrow and roundish.
Bark on Trunk	Bark on Trunk	Bark on Trunk	Bark on Trunk
Reddish-brown or dark green with whitish longitudinal striations.	Gray in color. On old trunk, rough with long ascending scales which project irregularly at the edges.	Dark gray with a reddish tinge. More or less furrowed. Separates into thin scales.	Dark gray. Mark- ed by longitudinal ridges and broken into plate-like scales.
Leaves	Leaves	Leaves	Leaves
Roundish, 3-lobed and finely and sharp- ly doubly toothed.	Usually 5 lobes, sometimes 3. Bays between lobes rounded. Lobes sparingly toothed	Usually 5 lobes, rarely 3. Lobes long, narrow and toothed. Silvery white on under-surface.	Lobes 3 to 5. Lobes broad and irregularly doubly serrate or toothed. White on undersurface.
Flowers	Flowers	Flowers	Flowers
Bright yellow, in slender racemes. Appear when leaves are fully developed.	Greenish-yellow, in clusters, on long, threadlike stalks. Appear with the leaves.	Greenish-yellow or pinkish, in clusters. Appear long before the leaves.	Scarlet or yellow- ish-red, in clusters. Appear before the leaves.



STRIPED MAPLE (Acer pennsylvanicum L.)

THIS Maple is of common occurrence in the central and western sections of Massachusetts, but rare or absent near the coast. In the tree form it is slender and graceful, attaining a height of twenty to twenty-five feet and a diameter of five to eight inches. Its favorite habitat is cool, rocky woods.

The bark on the trunk is reddishbrown or dark green, striped longi
STRIPED MAPLE
Leaf and fruit. One-third natural size.

tudinally with whitish lines which in time turn brown. The bark on the twigs is bright reddish-brown.

STRIPED MAPLE Winter twig and buds, One-half natural size.

The leaves are simple, opposite, from five to six inches in length and nearly as broad, three-lobed and pale green. In the autumn they change to a clear, light yellow.

The flowers, which are bright yellow in color, appear in slender racemes in late May or early June when the leaves are fully developed.

The wood is light, soft and without direct commercial value.

SUGAR MAPLE (Rock Maple) (Acer saccharum Marsh.)

HE Sugar Maple may be found abundantly throughout the State, although its occurrence is much less frequent toward the seacoast. Wherever it may grow, it is much at home in cool, rich woods and on moist, rocky slopes. Normally, it is a tree growing from fifty to sixty feet high, yet it often reaches a height of at least one hundred feet. In the open the branches

develop at a distance of eight or ten feet above the ground and make an acute angle with the trunk, thus forming, at least when the tree

is young, an egg-shaped head. Later in life the tree may assume a roundish form.

The bark on the old trunk is gray and roughened with long vertical scales which project irregularly at the edges. The young twigs



Leaf and fruit. One-third natural size.

SUGAR MAPLE

are reddish-brown in color and lustrous.

Winter twig The leaves are simple, opposite, from three to five inches in length and have three to five One-half natural size. lobes. The upper surface of the leaf is dark green, and the under-surface is pale green. In the autumn the foliage takes on brilliant shades of red, scarlet and orange. The flowers, which are greenishyellow in color, are borne on long, thread-like flower stalks and appear about the middle of April.

The wood is heavy, hard, durable, close-grained and capable of taking and retaining a good polish. It is used largely in the interior finish of buildings, in the making of furniture and in shipbuilding.

SILVER MAPLE (Acer saccharinum L.)

HE Silver Maple is met with occasionally in the central part of the State, though in the eastern sections it is rare or absent. It grows chiefly along streams and in rich intervales.

Normally, it is a tree from fifty to sixty feet in height, having a trunk which separates at a few feet from the ground into three or four upright stems that are destitute of branches for a considerable distance.



SILVER MAPLE

Leaves and fruit. One-third natural size.

The branches proper are long, slender and not infrequently pendulous.

The bark on the trunk is dark gray with perhaps a reddish tinge, more or less furrowed and separates into large, thin scales. bark on the twigs is chestnut-brown in color and lustrous.

The leaves are

simple, opposite, from six to seven inches in length and deeply five-lobed. The upper surface of the leaf is pale, while the lower surface is silvery-white. autumn the foliage becomes a pale yellow.

The flowers, which are greenish-yellow or sometimes pinkish, appear before the leaves, in late March or early April.

The wood is soft, weak and perishable. It is used in the making of furniture and sometimes for floors.

RED MAPLE (Acer rubrum L.)

ROWING in a variety of situations, though usually where it is wet, the Red Maple appears commonly throughout the State. It is a rapid-growing tree of medium size, with a low, narrow, round head. Normally, it rises to a height of forty to fifty feet and has a diameter of one to two feet. Usually the trunk

is continuous, though occasionally it divides into two or three upright stems. branches proper are rather slender and come

out at varying angles with the trunk.

The bark on older trees is dark gray, marked by longitudinal ridges and broken with plate-like scales. On the young shoots the bark is red and shiny.

The leaves are simple,

opposite, from three to four inches in length and have from three to five lobes. The upper surface of the leaf is light green and the under surface white. In the fall the

Winter twig and buds. One-half

green gives place to varying shades of scarlet or scarlet and orange.

The flowers appear before the leaves, in early April, and are scarlet or yellowish-red. Likewise, the fruit, which ripens in June, has a reddish coloring.

The wood is heavy, close-grained, easily worked and capable of taking a good polish. However, it lacks strength and decays speedily when exposed to alternations of moisture and dryness. It is used in the making of furniture, in turnery, for gun-stocks and for fuel.

MAPLE

BASSWOOD OR LINDEN (Tilia americana L.)

THE Linden is found in rich, moist soil in almost every part of the State. In habit it is a large tree, with an average height of fifty to sixty feet and a diameter of two to three feet. The branches are very numerous, comparatively small and slender and often somewhat pendulous. The head may be broad and round-topped or it may be conical.

On young trees the bark is gray and smooth, while on older trunks it is darker and deeply and irregularly furrowed. The twigs are yellowish-green or reddish-brown

in color.

The leaves are simple, alternate, very broadly eggshaped, from four to five inches in length a n d toothed.

The flowers are greenish - yellow and appear in late June or early July. The stalk which bears the flowers is attached to an

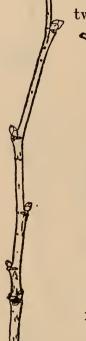
oblong, yellowish,

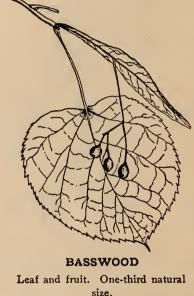
leaf-like body. The flowers themselves are pleasantly fragrant and rich in honey.

The fruit is globular, about the size of a pea, woody and gray in color.

The wood is light, close-grained, soft and more tough and pliable than almost any other wood. It is employed for paper pulp, in carriagemaking, for furniture and for wooden utensils.

The tree is a favorite with bee-keepers, for bees collect from its flowers a large amount of honey of a very desirable quality.





BASSWOOD Winter twig

and buds. Onehalf natural

BLACK GUM OR TUPELO (Nyssa sylvatica Marsh.)

HE Black Gum occurs rather commonly throughout Massachusetts, where it inhabits the borders of swamps and streams.

Here it is a small or medium-sized tree, of slow growth and of very variable habit. Its height development ranges from twenty-five to fifty feet and its diameter from one to two feet. The branches are slender

and angular, the lower ones horizontal or slightly drooping and the upper horizontal or slightly rising. The head is of vary-

ing form, cylindrical, conical, pyramidal, often flattopped and usually picturesque.

The bark onthe trunk is dark gray. On the old trunk it is divided



One-half natural size.

into many small scales. The leaves are simple, alternate, entire and from two to five inches long. In summer the leaves are dark green and lustrous on the upper surface. In the autumn the foliage takes on brilliant hues of scarlet and crimson.

BLACK GUM Winter twig and buds. Onehalf natural size.

The fruit, which ripens in October, is about onehalf inch long, blue-black and sour.

Its wood is heavy, soft, strong and not very durable. It is used for the hubs of wheels, for rollers and piles. It is difficult to split; hence, when it is made to serve for fuel, the logs are usually employed.

ASHES

How to know the Ashes

Black Ash	White Ash	Red Ash
(Fraxinus nigra Marsh.)	(Fraxinus americana · L.)	(Fraxinus pennsylvanica Marsh.)
Leaves	Leaves	Leaves
Leaflets 7 to 11 and with- out stalks, excepting the terminal one.	Leaflets 7 to 9 and supported by short stalks.	Leaflets 7 to 9 and sup ported by short stalks.
Winter Buds and Twigs	Winter Buds and Twigs	Winter Buds and Twigs
Buds black. Shoots olive- green, smooth.	Buds brown. Shoots olive-green, smooth and lustrous.	Buds brown. Shoots greenish and more or less covered with down.



BLACK ASH (Fraxinus nigra Marsh.)

THE Black Ash is found to a certain extent throughout the State, though more abundantly in the central and western portions than in the eastern. It confines itself almost exclusively to rich, moist ground in the vicinity of streams and swamps.

In habit it is a very slender tree, usually growing to a height of sixty to seventy feet and having a diameter of one to two feet. In the woods the trunk is slim and without branches until near its very top.

In the open it may have a broad, round head.

The bark on the trunk is dark gray and marked by parallel ridges. The season's shoots are olive-green and smooth, and the buds are black.

The leaves are opposite, twelve to fifteen inches



BLACK ASH
Leaf and fruit. One-third natural size.

in length and consist of seven to eleven leaflets. These are oblong, four to five inches long, remotely toothed and without stalks, except in the case of the terminal one.

The flowers and fruit for all superficial purposes resemble those of the White Ash.

The wood is heavy, soft, tough and durable. It is used in cabinet work, for interior finishing, for hoops and for baskets. For this last purpose it is held in very high esteem.

WHITE ASH (Fraxinus americana L.)

THIS rapid-growing tree occurs in all parts of Massachusetts and on every kind of ground, although it thrives best in deep, rich soil in the vicinity of streams.

As to habit, it usually attains a height of fifty to seventy-five feet and a trunk diameter of two to three feet. In the open the trunk divides at a few feet from the ground into two or three large limbs, then assumes a broad, round head.



WHITE ASH

Leaf and fruit. One-third natural size.

The bark on the trunk is dark brown or deep gray. It is deeply divided by furrows, which are parallel or connect at intervals into broad, flattened ridges. The season's shoots are olive-green and smooth.

The leaves are opposite, eight to twelve inches in length and composed of seven to nine leaflets. The individual leaflets are egg-shaped or oblong, three to five inches in length, stalked, remotely toothed and dark green on the upper surface.

The flowers appear in May before the leaves.

WHITE ASH — Concluded

The fruit is a winged body, oblong in shape and one to two inches in length. It ripens in late August or September and often hangs on into the winter.

It is a valuable forest tree and the most useful of the Ashes. The wood is heavy, hard, strong, tough and elastic. It has many uses. It is employed in the manufacture of agricultural implements, in the making of furniture, for the handles of tools, in carriagebuilding and sometimes for interior finishing.



WHITE ASH

Winter twig and buds. One-half natural size.

RED ASH (Fraxinus pennsylvanica Marsh.)

THE Red Ash, not infrequently mistaken for the White Ash, occurs occasionally throughout Massachusetts. Its home is in low, rich soil near streams and swamps.

In habit it is very much like the White Ash, though it is usually smaller in every way. It seldom grows to a height of more than fifty or sixty feet and its diameter rarely exceeds eighteen to twenty inches. In the open the head is rather broad and round-topped.



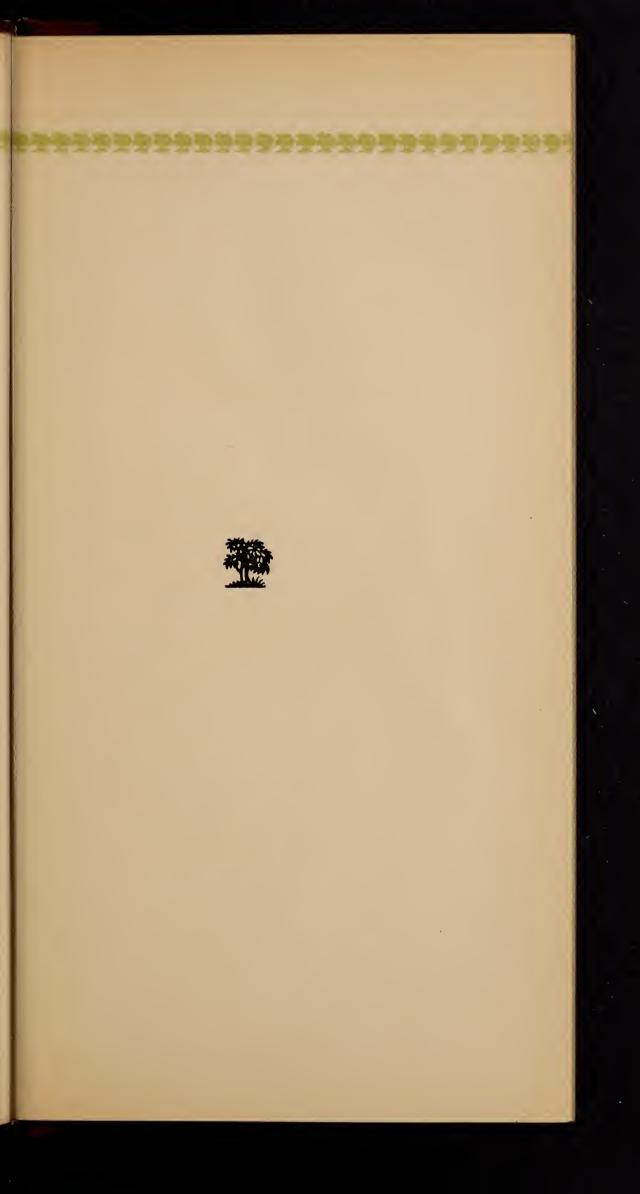
Leaf and fruit. One-third natural size.

The bark on the trunk of a mature tree is dark gray or brown and furrowed, but less deeply and more regularly than in the case of the White Ash. The season's shoots are greenish-gray and coated with numerous fine hairs which often persist until the second season.

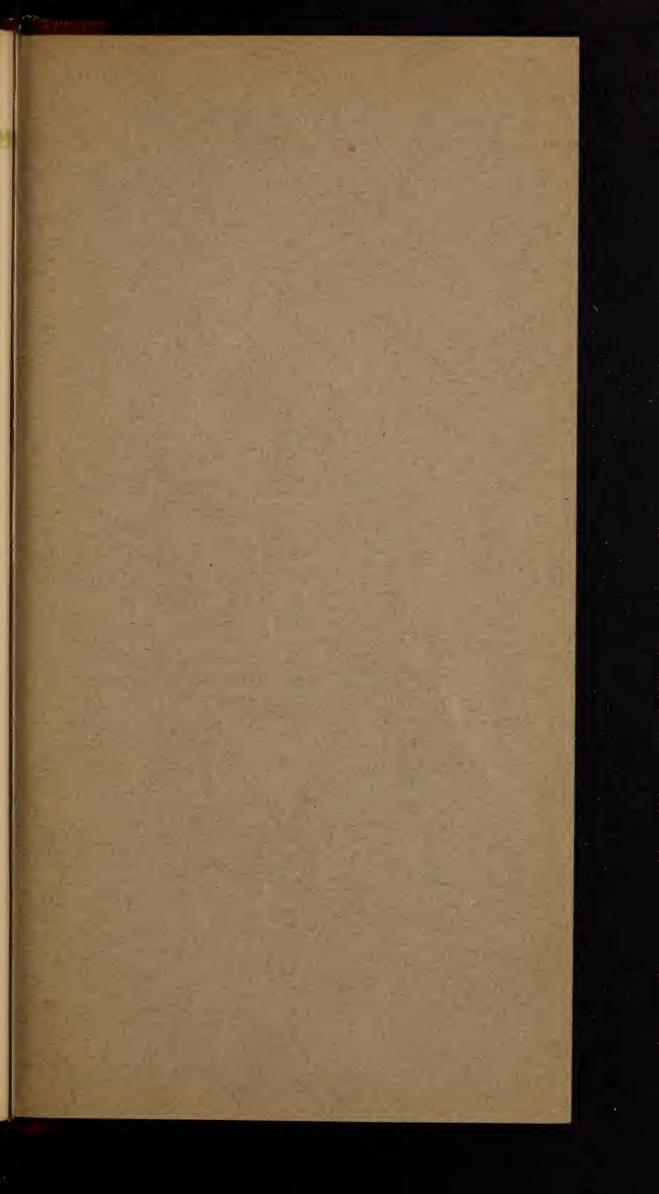
The leaves are opposite, compound, ten to twelve inches in length and composed of seven to nine leaflets.

The flowers and fruit, to all intents and purposes, are similar to those of the White Ash.

The wood is heavy, hard and brittle. It is much inferior to that of the White Ash, though it is used for many of the same purposes.















The Evergreens

Methods of Study in Public School

*

A Home Teacher

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By C. M. WEED, under the Direction of F. W. RANE, State Forester, State House Boston, Mass., U. S. A.



THE

STUDY OF THE EVERGREENS

IN THE

PUBLIC SCHOOLS.

PREPARED BY
CLARENCE M. WEED,
UNDER THE DIRECTION OF
F. W. RANE, STATE FORESTER.



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Approved by
The State Board of Publication.

PURPOSE.

This publication is offered by the State Forester as supplementary to "The Study of Trees in Our Primary Schools," issued by this office last year.

The coniferous or evergreen trees make an interesting group to study by themselves. They can be utilized by the teacher in the winter time, or dormant season of the year, when other material is not so accessible. In fact, at this season of the year they give great variety and beauty to the landscape. The interest in and association with the evergreens become very pronounced as soon as the deciduous tree leaves have changed from their natural beauty of summer to their grand autumnal glory, and finally fallen to the ground. The uses to which the evergreens are put at yuletide, and their part in making this season of the year one of the happiest to the child mind, make this the psychological time for their study.

If this treatise helps to awaken in our young and coming generation a greater interest and love in trees and nature it will have done its part.

Two other publications that teachers may find of assistance, if they do not possess them already, are:—

"The Commercial Forest Trees of Massachusetts. How you may know them. A Pocket Manual," for general use.

"The Study of Trees in Our Primary Schools," for teachers, mothers, and all interested in teaching children to love trees and nature.

Under the Resolves of 1908, chapter 121, the Governor and Council have designated that these publications be sold by the State Forester at a price not less than the cost thereof; and additional copies may be printed, the expense thereof to be paid from the receipt of such sales.

According to this decision the above-named publications are offered at the following prices:—

"The Commercial Forest Trees of Massachusetts. How you may know them. A Pocket Manual," for five cents a copy at this office, or by mail for two cents extra.

"The Study of Trees in Our Primary Schools," for twelve cents, or by mail eight cents extra.

In case a large number is wanted, as for schools, etc., they can be forwarded by express.

These publications are neatly gotten up, and as they are in great demand (the first edition of 5,000 having been exhausted in ten days), charging for them at cost is the only feasible method of dissemination.

ACKNOWLEDGMENTS.

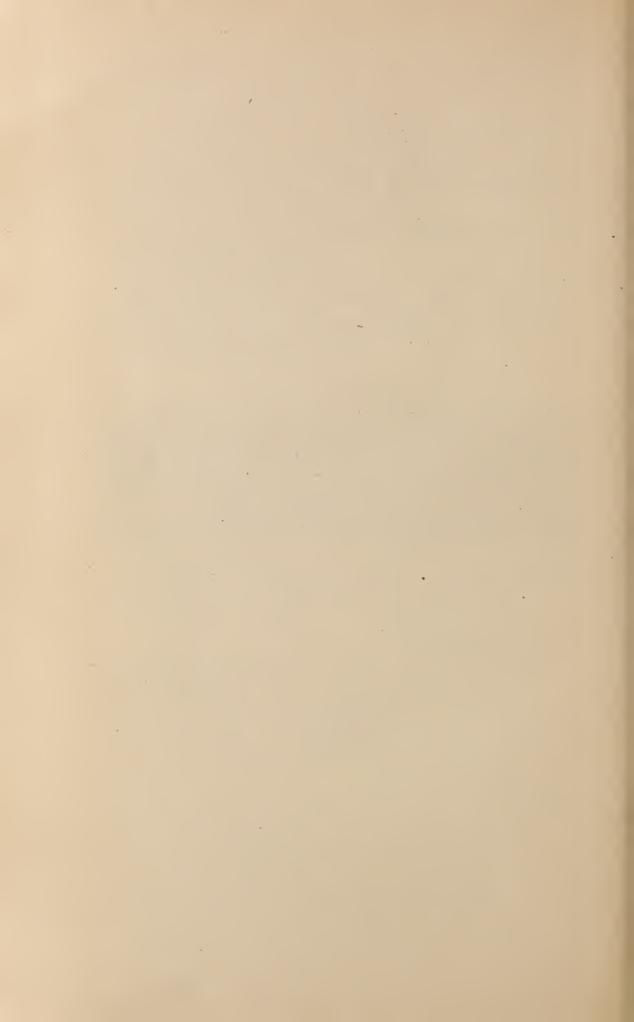
Dr. Clarence Moores Weed, of the Lowell State Normal School, was selected to prepare this pamphlet. Owing to Professor Weed's knowledge and interest in public school work, he requires no introduction to Massachusetts teachers. In fact, the syllabus and suggestions herein given have passed the experimental stage, and have been successfully taught as outlined.

The illustrations are from prints and drawings by pupils in the Lowell Normal School and its training schools.

F. W. RANE,

State Forester.

STATE House, Boston, Mass., Oct. 1, 1908. The ear shares with the eye the beautiful effects of weather on the landscape. The rushing of the storm through the narrow valley, the murmuring tremor of the pines in the gentle breeze, the rustling and bowing of a field of corn in an August gale, the clatter of palmettos in a wind, the rattle of pebbles on a beach, dragged down by the retiring wave, the onset of a thunder shower, — are delights for the ear as well as the eye. — Charles W. Eliot.



THE CONIFEROUS EVERGREENS.

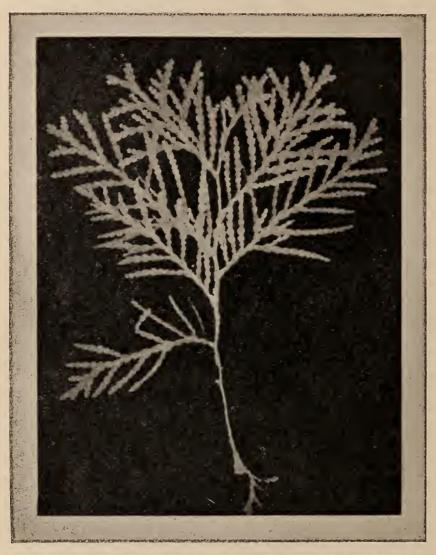
The study of the coniferous evergreens is especially desirable early in winter, and for the lower grades may well culminate at the time of the holiday festivities.

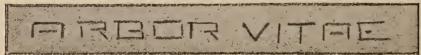
These trees furnish the most important features of many of our winter landscapes; they are of great beauty as well as of much economic value, and they give excellent opportunities for studies of distinctive educational worth. Their branches are easily obtained, and when brought into the schoolroom are of decided decorative value. They may be studied to great advantage in winter as they are available at a time when it is most difficult to get material for nature studies.

In this study of the evergreens especial emphasis should be placed upon the native species. These are to be found in fields and woods, where specimens may be gathered in abundance. A very large proportion of the conifers planted for ornamental purposes are exotic species, the determination of which is frequently difficult, and which have not the interest and associations possessed by the native sorts. An exception, however, must be made in the case of the Norway spruce, which has been so generally planted for so long a period that it is as abundant and as widely distributed as some of our native trees.

In associating the evergreens with the animal life of the winter season, the skillful teacher will point out the utility of their seeds as food for the winter birds, and the great benefit of their protection as homes, not only for the birds but for rabbits and other animals that require shelter during the winter months. The value to the trees themselves of their slender leaves in shedding snow will of course be pointed out.

In most localities it is a comparatively easy matter to get abundant material for the study of the evergreens. This is one reason why the subject should be reserved for the winter season. Two or three small branches will furnish enough leaves of a given species to suffice for a whole class, and wherever there are large bearing trees, with little trouble one





can get the cones which are so necessary to an adequate study of these trees. The cones of the white pine may generally be found in abundance underneath the trees, while those of the pitch pine, though generally less numerous on the ground, are frequently within easy reach upon the lower branches. By a little searching one may often find trees which have been blown over or cut down, so that the cones in the topmost branches may easily be reached. This applies not only to the pines but also to most of the conifers.

The cones of some of the spruces fall to the ground early, where they may readily be gathered. This is particularly true of the Norway spruce, the large and beautiful cones of which furnish most interesting objects for study. In the case of the black spruce, which abounds in peat bogs, the cones are generally within reach upon the smaller trees; this is also commonly true of the hemlock, the arbor vitæ and the tamarack or American larch. The curious berry-like fruits of the red juniper and the low juniper are also very easy to obtain.

The teacher who does not avail herself of the opportunity to make the collecting of these evergreens the object of many winter walks will miss a personal pleasure, and will not secure the enthusiasm from her pupils that she might easily get.

In the cities one can often obtain fir balsam and some of the spruces at Christmas time among the trees offered for sale as Christmas trees. It will frequently happen that such trees may be obtained directly from the pupils after the Christmas season is over.

In the hot, dry rooms of most schools the spruces, hemlock and other conifers whose leaves are shed in drying dry out rapidly and fall off, and may cause trouble for the janitors. This may be avoided to a considerable extent by keeping the specimens in unheated closets, or hanging them out of doors, when not in use; they will thus retain their leaves much longer.

METHODS OF STUDY.

The teacher who appreciates the value of visual impressions in nature study will display before the pupils twigs and cones of the pines, and such other conifers as do not drop their leaves in drying, mounted upon good-sized sheets of paper or cardboard and plainly labelled. She will also make upon the blackboard characteristic drawings of the various species studied, using as far as possible colored

crayons, showing the appearance of cones and branches, as well as detail drawings of the leaves upon a larger scale.

The evergreens may be used to great advantage in bringing the pupils into direct contact with real things in nature. The material is so easily obtained, and in such abundance, that there is no excuse for adopting the mere question and answer method in vogue in many of our schools. Give the pupils twigs, or at least bundles of leaves, and if possible cones, and let them use their discriminating powers in sorting the specimens as to species. Let them see for themselves the distinctive characters of each, and in the higher grades let them determine the species by reference to illustrated tree books. Then let them make careful drawings of the twigs or leaves and cones of each species, being sure that they know the name while they are making the drawings. Part of the drawings at least should be made with a lead pencil, securing as great a degree of accuracy as is possible, but some of them should be made with green and brown pencil crayons, by means of which very attractive pictures may be obtained. upper grades it may also be worth while to use water colors for some of the drawings.

The importance of blackboard drawings by the pupils, especially in the grades above the fourth, can hardly be overestimated. These are especially valuable for the memory drawing, and in the case of the evergreens, through the use of green and brown crayons, the great advantage of colors that simulate the actual plants may be utilized.

Very beautiful Van Dyke solar prints may be made of many of the evergreens. Examples are shown in the accompanying illustrations of the arbor vitæ and the white pine.

In addition to the drawings the pupils may use the same specimens for language work, which shall take the form of short essays in which the chief characteristics of the specimens are described. The length and completeness of these descriptions will of course vary with the development of the pupil, but something worth while may be done in any grade above the fourth. These written exercises should be upon paper the same size as the drawing paper. Dictation exercises may also be given, using poems and prose selections treating of the various evergreens.

For the written descriptive exercises the pupil in the intermediate and upper grades should have before him upon the blackboard some such outline as the following. The wise teacher will of course adapt it to the degree of development of her pupils, leaving out those things which the pupil will be unable to describe to advantage. If there are no cones it may be better to omit that topic.

Outline for Description of a Conifer.

1. Leaf:—
Arrangement,
Color.
Length.
Shape.
Apex.
2. Bark:—
Color.
Surface.
3. Buds:—
Color.
Shape.

Surface.

4. Fruit:—
Color.
Size.
Shape.
Scales.
Seed.
5. Tree:—
Manner of growth.
Range.

Many of the conifers have distinctive odors, which may well be noted in their study. The aromatic perfume of the arbor vitæ is very different from the resinous odor of many of the pines, and would serve to identify it at any time.

Upon the foundation laid by the studies thus outlined a more complete superstructure may be built by a study of the trees out of doors, beginning with such as may be seen from the windows of the schoolroom, and continuing as far as possible by means of outdoor excursions. Occasional reviews with actual specimens, and memory drawings of leaves and cones, as well as sketches of the growing trees, will be helpful in making permanent the pupils' knowledge of the evergreens.

The final visible result of the pupils' work may be a booklet, into which is bound the drawings, the mounted specimens, the descriptions and the written selections. The completeness of these booklets and the perfection of their work will depend, of course, upon the development of the pupil and the kind of supervision given. To some extent such booklets

may be made in every grade of the lower schools, and they certainly may be made to great advantage in the high and normal schools. Some standard size of drawing paper, which is of good shape for artistic results, should be selected. A good size is six by nine inches, as this enables one to put both the mounted specimen and the drawing upon the same sheet if desired. To accompany the drawing paper there should be sheets of writing paper of the same size, ruled or unruled, as the development of the pupils may necessitate. All the sheets are to be punched upon the left-hand six-inch margin, so that they may be bound in covers of stiffer paper, either by the ordinary brass fasteners or preferably by means of raffia. In the latter case it is desirable that three holes be punched in the margin.

Examinations.

It is very easy to determine whether the pupils know the evergreens they have been studying or not. Place a small branch and cone of each variety upon a side table, numbering each species, and let the pupil, absolutely without assistance, make a list of the names of the evergreens represented. Memory drawings may also be utilized for examinations, or the pupils may be required to write a synopsis of the distinctive characteristics of a certain number of species.

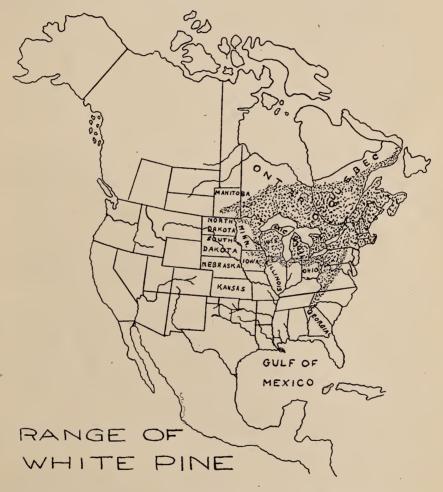
Correlations.

It may be worth while, at the risk of some repetition, to indicate briefly the correlations with other studies which may properly be carried on in connection with the study of the evergreens.

In language it is obvious that any written or oral exercise describing the evergreens is simply one phase of English expression, and may very well be utilized as work in composition. It is also readily seen that the pupil who secures, through the study of the evergreens, adequate mental images of the characteristics of the different species, and of the appearance of the trees, either singly or in forest groups, is preparing himself to appreciate references to these trees in literature. This appreciation will be increased through the

use of selections from the best writers of prose and poetry, as recommended on a previous page.

The correlation with drawing is so evident that it need scarcely be dwelt upon. No nature study is at all adequate which does not constantly afford the child opportunity to express, through graphic representation, what he sees. In the case of the coniferous trees it is especially desirable that the appearance of the tree as a whole be represented from the



point of view of the art supervisor, and that the cover designs for the booklets be made according to his suggestions. It is desirable, also, that some of the selections be from those artists who have written appreciatively of the outer world.

It is easy to see the lines which should be followed in correlating the study of the evergreens with geography. The range maps will form the foundation for this. The use which is made of these trees for commercial purposes, as lumber, as the basis for wood pulp, as the source of turpen-

tine, pine tar, Canada balsam and similar products indicates that in treating of the product the source from which it comes should receive adequate consideration. The importance of the great coniferous forests as features of the landscape and as modifiers of climate are facts of great geographic interest. The natural distribution of our various native species may also serve as a basis for interesting studies in geography.

In the lower grades the bundles of needles of the pines could advantageously be used for combinations in number work. In the higher grades interesting computations may be made as to the number of leaves on a given branch or a given tree.

The value of the conifers in forestry and in ornamental planting will of course be emphasized. Wherever practicable each pupil should be led to transplant in spring or early autumn at least one evergreen about his home. Just as soon as possible there should be an assortment of native conifers growing on the school grounds.

SEQUENCE OF STUDY.

A natural sequence of study of the evergreens through the grades may be indicated as follows:—

Grades 1 to 3. — Definite acquaintance, making through sense perceptions and name connections. The pupils to see, hear, feel, taste, plant and enjoy, in every way possible, as many of the evergreens as may be; and always to know the name of the species they are utilizing.

Grade 4. — Review of conifers in connection with topic of seed dispersal.

Upper Grades. — In one upper grade a definite study of the families of conifers, with individual booklets, including the native species. In other grades correlations with geography, language and drawing.

LISTS FOR THE LOWER GRADES.

In making out the following list the species most easily recognized are placed first, although in many localities the sequence might well be modified to meet local conditions. The sequence is of comparatively little importance, however, provided there is a definite list for each grade, so that when the pupils enter the fourth grade they will not have been studying a few of the abundant species to the exclusion of the others. Constant reviews, of course, are necessary, but when the pupils really know a species a new one should be taken up.

First Grade.

- 1. White pine.
- 2. Pitch pine.
- 3. Norway spruce.
- 4. Arbor vitæ.
- 5. Hemlock.

Second Grade.

- 6. Red pine.
- 7. Fir balsam.
- 8. Low juniper.
- 9. Black spruce.
- 10. American larch.

Third Grade.

- 11. Juniper.
- 12. Red cedar.
- 13. Yew.
- 14. Red spruce; white spruce.
- 15. Cypress.
- 16. Southern white cedar.

A good time to begin the study of the conifers in any of the grades is late in November, four or five weeks before the holiday vacation. The subject can be gone over pretty thoroughly before the term ends, and rapidly finished when the winter term begins. It may well be followed then by a study of the broad-leaved evergreens.

THE CONIFERS TO STUDY.

First Year List.

White Pine (Pinus Strobus). — Leaves arranged in clusters of five, each leaf being long and slender and averaging from 2½ to 4 inches in length; its margins are finely serrate, and in cross-section it is triangular. Green in color, with two or three distinct whitish lines on the two lower surfaces. Bark of young twigs olive brown, covered with a brownish pubescence; bark of older twigs smooth and shining. Scars where the bundles of leaves have fallen off broadly oval, sometimes nearly circular. Buds conical, with a distinctly pointed tip; they are rather small, averaging ¼ inch in length. Cones large, slender, 4 feet to 6 feet long; scales resinous, whitish brown, each scale distinctly pointed; rather

¹ While the larch is not an evergreen it is a conifer and is usually associated with evergreens.

thin at the tip, with their apical margins rounded and smooth. Seed with wing.9 inches long, light brown in color. One of our most important commercial trees, which is being planted in great numbers in Massachusetts for lumber purposes.



Pitch Pine (Pinus rigida). — Leaves arranged in clusters of three, each leaf being long, rather stout and roughened by a row of serrations along three of the margins, the teeth pointing toward the tip. Green, with narrow rows of white spots on all the sides. Bark of young shoots yellow brown, not pubescent; its general appearance rough on account of

the scales, from in front of which the bundles of leaves come out. Bark of older branches duller yellow brown. Terminal buds very resinous, rather long, cylindrical with a conical tip, averaging \(^3\)/8 inch in length; usually two or three or more smaller accessory buds beside the main terminal bud. Cones large, broad, 2 feet long. Scales thickened at the tip, with a stout sharp spine at the middle of the outer margin; borne on the sides of the branches, often in small clusters. Seed with wing 6 inches long; wings very delicate in texture, whitish, with stripes of brown. Called also torch pine.

The pitch pine is a much less important tree than the white pine, but throughout the northern States it is abundant and generally distributed. The tree is at once distinguished from the white pine by the lighter color of its leaves, as well as by their coarser appearance, and by the broad cones which hang upon the branches in all parts of the tree for many years after the seeds have been dropped. The younger cones are bright reddish brown in color, while those which have been weather-beaten for many years become a dark slaty gray color.

Norway Spruce (Picea excelsa). — Bark of season's shoots light reddish brown; of older shoots much darker. Buds subconical, the imbricated scales reddish brown, with their margins slightly darker. Leaves yellow green, more bluish green on the under surface; arranged spirally on the branches, but the lower ones twisted around so as to give a flattened effect to the lower surface and a brushlike effect to the upper; average length, ½ inch. Cross-section of each leaf nearly square, with parallel rows of whitish dots upon each of the four sides; apex bluntly pointed. Cones very large, averaging when expanded 5 inches long by 2 inches broad. Margins of the scales rather thin, slightly and irregularly toothed, with the exposed portion having somewhat of a triangular effect, though the point of the triangle is generally truncate. Winged seeds light reddish brown in color, 1/3 inch long by \(\frac{1}{6} \) inch broad.

The Norway spruce is, perhaps, the most generally planted for ornamental purposes of all the evergreens. Although not a native species it is so universally distributed and its cones are so characteristic that it probably will need to be included in any study of the evergreens.

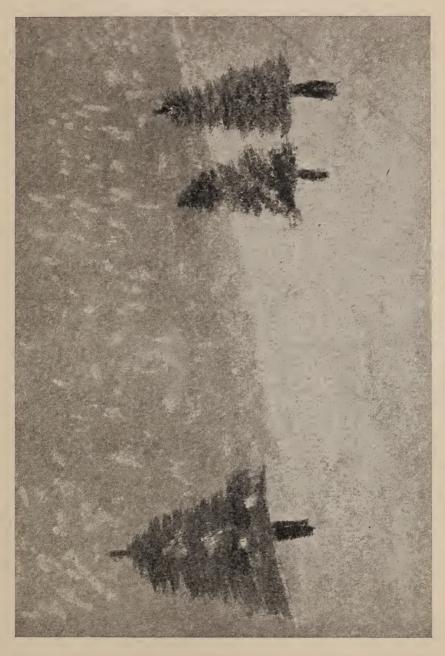
Arbor Vitæ (Thuja occidentalis). — Easily recognized among all the evergreens by the flattened, frond-like character



DESIGN OF PITCH PINE NEEDLES. FIRST GRADE.

of the foliage, the leaves being very small and suggestive of closely appressed, imbricated scales. Bark of older parts of the twigs somewhat shining, grayish brown. Cones small, ovoid, 5 inches long, with few obtuse scales, chestnut brown

in color. Seeds elongate oval, broadly winged on both sides. Fully developed tree generally of conical form. Foliage with a distinct, characteristic, aromatic odor, which probably arises chiefly in the little glands upon the leaves.



CRAYON DRAWINGS OF PINE TREES. FIRST GRADE.

The arbor vitæ is one of the most generally distributed of the evergreens. It is a native of the northern States, and is probably more widely planted for hedges in private grounds and public parks than any other conifer. The Indians used to call the plant by the characteristic name of featherleaf. Some confusion is likely to arise because in many regions this species is called the white cedar, but it is very distinct from the true white cedar, or, as the latter is sometimes called, the southern white cedar. When growing in the open the arbor vitæ assumes the form of an attractive pyramidal tree.

Hemlock (Tsuga Canadensis). — Branches generally horizontal and having a flattened appearance, due in part to the horizontal position of the leaves, which are commonly two ranked on each side. There is also a row of leaves along the upper side of the twig, each leaf parallel with the twig, and in typical cases lying nearly flat upon it. In these cases the apex of the leaf points to the apex of the twig, so that the normal lower surface of the leaf becomes here the upper surface; these leaves are generally less than half the length of those that project sideways. The ordinary leaves generally a little less than ½ inch long and not quite ½ inch wide, each leaf having a short petiole and generally a rounded tip; the upper surface bright, shining green, the under surface appearing very much lighter, due largely to the whitish stripes along the midrib and along each side of it. Crushed leaves have a distinctly resinous odor. Youngest twigs pubescent, light grayish brown in color; older twigs much darker and roughened by the scales from which the leaves have The leaves fall off in drying.

The hemlock is one of the best known and most characteristic of the evergreens. It is widely distributed throughout the United States and Canada, sometimes becoming a forest tree more than 100 feet high. The lower branches are apt to be scraggly, so that it is not so commonly planted in open ground as some of the other evergreens.

Second Year List.

Red Pine (Pinus resinosa). — The red pine is at once distinguished from the other native pines of the northern States by its long leaves, arranged in pairs in a rather long sheath, and its cones, borne at or near the ends of the branches. The slender leaves are 4 to 6 inches long, and the sheaths are from ½ inch to 1 inch in length. The cones are only about 2 inches long, nearly egg shaped, and the scales are smooth.

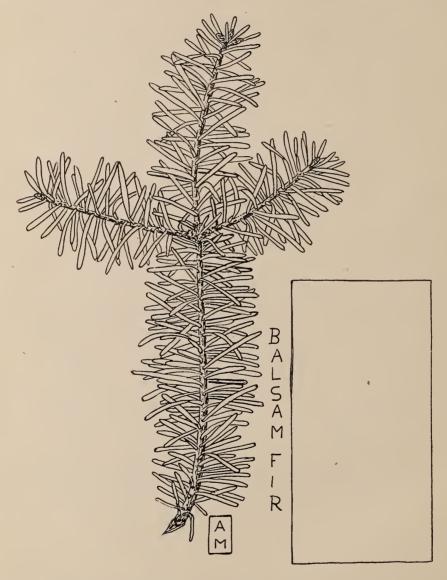
Balsam Fir (Abies balsamea). — General aspect of leafy horizontal branches flattened, due to the approximately horizontal position of the leaves. Upper surface a bright, clear green, under surface markedly bluish green. Each leaf sessile, averaging 3/4 inch in length, with the sides nearly parallel and the apex distinctly notched; upper surface bright, deep green, with a longitudinal depression in the middle; lower surface with two broad whitish stripes, one on each side of the distinctly projecting midrib. Bark of season's shoots light reddish brown, rather thickly covered with stiff brown hairs; bark of older twigs darker. Buds clear reddish brown, with the imbricated scales covered by a transparent shiny varnish; subconical and rather small, averaging about 1/6 inch. Leaves with a distinct balsamic odor and aromatic taste. Cones large, averaging 4 inches long by 1 inch wide, with the margins of the scales rounded; projecting upward from the small branches.

The balsam fir is an abundant tree in the northern forests. It is noted for the fragrance of its branches and for the transparent resin produced upon the bark, which is the source of the Canada balsam, largely used for preserving objects for microscopic study as well as for other purposes. The wood is used largely commercially in making paper pulp.

Low Juniper (Juniperus nana). — A low-growing shrub, often occupying circular areas in dry pastures and on open hillsides throughout the northern States and much of Canada. Leaves awl shaped, commonly coming out of the stem in whorls of three, sometimes simply opposite in two; hollowed on under side and curved downward as seen from Upper surface deep green; general effect of under surface blue green on account of the whitish stripes along the middle of the under surface of each leaf. Bark of the last season's twigs very light brown, with a greenish or grayish tint; bark of the next to the last season's growth reddish brown, and of older branches dark brown. Leaves 5 inches to 6 inches long. Fruit a berry-like object, 1/4 inch long by ½ inch broad; blue, with a glaucous bloom. The berry is formed by the union of the thickened fleshy scales, the tips of which may generally be seen. These enclose the three

nutlike seeds, which are curiously margined and sweetish aromatic in taste. When crushed the fruits have a distinctive aromatic odor. Called also ground cedar and ground hemlock.

Black Spruce (Picea mariana). — Bark of young branches reddish brown with a short pubescence, the hairs being brown-



ish or whitish. Leaves encircling the young twig yellow green or green in color; average length 4 inches; cross-section obtusely four angled; longitudinal lines of whitish spots generally to be found on each of the four sides; apex acute. Twigs straight or slightly curved, and commonly coming out of the main trunk nearly horizontally. Buds commonly arranged in groups of three at the ends of the more vigorous

twigs. Scales reddish brown, lower ones with long points at the tip, upper ones with thin margins; general shape ovate. Bark of older branches commonly blackish, giving a generally dark appearance to the tree, which grows especially in peat bogs from the far north southward to Michigan and New Jersey. Cone.9 inches to $1\frac{1}{2}$ feet long, oval in outline, each scale having along the outer margin numerous irregular teeth; remaining on the twigs for several seasons.

The black spruce grows abundantly in the so-called spruce bogs of the northern States. It is not a very good tree for ornamental purposes, as even in its favorite localities it is commonly unsymmetrical. It is often brought into the market as a Christmas tree.

American Larch (Larix laricina). — In early winter the twigs are commonly bare, having dropped the leaves late in autumn. Bark of season's shoots light reddish brown, with more or less of a glaucous bloom. Buds on these shoots globose, dark reddish brown, shining, the imbricated scales having thin margins. On older twigs the bark is darker, commonly being slaty gray in color, and the buds are on the tips of very short branches.

The American larch or tamarack is one of the most abundant cone-bearing trees to be found in the swamps of the northern States. It is a distinctive tree that seems to require an abundance of moisture. In the summer its numerous fine leaves give it an attractive appearance, which is largely lost when the leaves drop off late in autumn.

Third Year List.

Common Juniper (Juniperus communis). — Distinguished from the low juniper by its tree-like form, with slender and rather straight leaves. It is a northern species, which extends southward to Michigan and New Jersey. By many botanists it is considered the same as the low juniper.

White Cedar (Chamæcyparis thyoides). — Bark of smaller twigs reddish brown, somewhat shining, with the ends more or less greenish. Leaf buds rather small, without scales. Leaves minute, scale-like, opposite and four ranked, covering the twig; tips sharply pointed. Most of the leaves have a

rounded greenish gland on the middle of the back. Fruit a curious cone, usually rather small, seldom more than ½ inch in diameter, with the scales opening on the inside and several minute winged seeds under each scale. Color of cone dull brownish purple. Called also cedar.

The white cedar is generally found along the eastern coast of the United States, although inland it occasionally occurs in deep swamps, where it often forms the principal tree growth. It is sometimes confused with the arbor vitæ, largely because the latter is also called white cedar. It is easily distinguished from the arbor vitæ by its curious brownish purple, more or less globular cones. The trees sometimes reach a height of 50 feet, and the wood is famous for its durable quality. Logs have been taken out of peat bogs and found to be in good condition to work into lumber.

Red Spruce (Picea rubens). — Leaves rather short, generally less than ½ inch long, obtusely pointed, dark green, with longitudinal rows of white dots showing through a lens. Surface of last season's twigs deep brownish red, with the distinct sterigmata which make up this surface covered quite densely with stout, prominent, brownish or blackish hairs, and with the projections that serve as the bases of the leaves unusually prominent. Bark of earlier years' growth darker, especially on the sides most exposed to the weather. Buds rather prominent, reddish brown or brownish red in color, darker at the obtusely pointed apex. Surface of buds hairy. Cones deep reddish brown in color, quite regular in size and shape, when fully opened averaging 1½ inches long by 1 inch Scales with the margin slightly irregular, giving a suggestion of short, obscure teeth. Seed with its wing \frac{1}{3} inch long, the wing at its broadest part being half that width. General outline broadly triangular, with the light grayish brown wing terminal on the dark brown seed.

White Spruce (Picea Canadensis). — Bark of season's shoots light brown, with bases of leaves of a slightly reddish brown tinge; bark of older branches very much darker. Buds subconical; scales reddish brown, imbricated. Leaves bluish green, a little lighter when seen from below; those on the under part of the twig twisted around so as to give the upper

surface of the branch a much more dense appearance than the lower surface. Average length of the leaf ½ inch; four angled, sharply pointed at tip, with stripes of white dots on each of the four sides. The bruised leaves have a pungent, aromatic, slightly disagreeable odor. Cones generally termi-



BLACK SPRUCE

nal on the smaller twigs, when fully developed averaging $1\frac{1}{2}$ inches long by $\frac{3}{4}$ inch broad, generally ovate cylindrical when opened. Scales with thin and more or less rounded margins, the middle of the margin being commonly truncate and generally entire. Seeds rather small; length with wing being but $\frac{1}{4}$ inch; width of wing $\frac{1}{6}$ inch.

The white spruce is one of the most beautiful of our native evergreens, forming a tall pyramidal tree, with the branches extending from the ground. The cones drop off soon after fruiting, so that they may be found beneath the tree at any time. The blossoms appear during April and May.

Red Cedar (Juniperus Virginiana). — The twigs of this common evergreen are especially interesting because of their two forms of leaves. In one form the leaves are small and scale-like, arranged in opposite pairs which alternate with each other, each leaf being acutely pointed and subtriangular in its shape. The other form of leaf is long and slenderly lanceolate or needle-shaped, with a very sharp point. This second form of leaf seems in general to be present upon the twigs and branches which have grown rapidly. The bark of the older parts of the branch is reddish brown and shining. The fruit is a bluish, berry-like object, the size of a pea, in which the thickened outer scales have grown together to enclose the three or four angular seeds. Called also savin.

The red cedar is an interesting and characteristic tree, scattered over almost the whole of eastern North America. It varies greatly, but in its typical form it has a characteristic columnar appearance which is very attractive. The berries form a large part of the winter food of many birds, so much so in the case of the cedar bird as to give that species its common name. The tree belongs to the genus *Juniperus* and is sometimes called the red juniper.

American Yew or Ground Hemlock (Taxus baccata). — General appearance of the leafy branches flattened in a way suggestive of the hemlock, the leaves, however, being much larger and more robust, and the color very much more of a yellow green. Average length of leaves ½ inch to ¾ inch; width, ½ inch. Each leaf narrowed at the base into a short petiole and sharply pointed with a mucronate apex; longitudinally convex above and concave below. Midrib projecting on both surfaces, more prominent on upper. Shining yellow green on the upper surface, less shining and lighter on lower surface. Bark of young twigs shining greenish brown; of older twigs reddish brown. Buds small, with rather thick imbricated scales. Each scale brownish green, with a whitish longitudinal stripe along the middle and sometimes upon the

margins. Fruit a curious, red, berry-like object, formed by the disk becoming pulpy and cup-shaped, so as almost to cover the hard seed; ½ inch long. Small masses of the cut twigs have a curious musky odor, very different from that of any other of our evergreens. The leaves remain upon the twigs in drying.

Synopsis of the Conifers.

The conifers as a whole are distinguished from the majority of seed-bearing plants in that the seeds are borne on the face of a scale rather than enclosed in an ovary. Our native species belong to two families, — the pine family, which includes all but one of them, and the yew family. The former is characterized by cone-like fruits, while the latter is characterized by its soft, berry-like fruit.

The Pine Family (Pinaceæ).

The Pines (Pinus). — The pines are known by having the leaves needle-shaped and in clusters of two to five, and by the numerous woody cone scales. The three following species are the most generally distributed native species: —

White Pine (Pinus Strobus). — Leaves long, five in a sheath; cone long, with margins of cone scales smooth and unarmed.

Pitch Pine (Pinus rigida). — Leaves long, three in a sheath; cone broad, with outer end of cone scale armed with a pointed tooth.

Red Pine (Pinus resinosa). — Leaves long, two in a sheath; cones not long, oval conic; margins smooth.

The Larches (Larix).

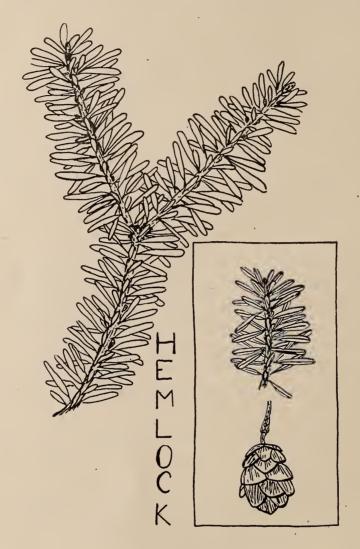
The larches are characterized by having the leaves in dense clusters on the ends of very short branches, the leaves falling off late in autumn. Our native species:—

American Larch or Tamarack (Larix laricina). — Small, short, pale green leaves, in dense clusters. Small branches, not drooping. Cones persistent and erect on twigs.

European Larch (Larix Europæa). — Distinguished by the drooping character of the branches. Commonly planted for ornament.

The Spruces (Picea).

In their general aspect the spruce trees are similar, being conical in outline and having rather short, four-sided leaves, which spread in all directions on the branches, although they



commonly project upward in a manner that gives them a brush-like effect. Leaf buds scaly and generally more or less resinous.

Norway Spruce (Picea excelsa). — Distinguished by the large cones, 4 or 5 inches long, and the drooping position of the smaller branches. An introduced species.

White Spruce (Picea Canadensis). — Distinguished by the absence of hairs upon the bark of the smaller branches; cones oblong, cylindrical.

Red Spruce (Picea rubens). — Distinguished by slender pubescent twigs, with sharply pointed leaves, and cones that fall off.

Black Spruce (Picea mariana). — Distinguished by stout pubescent twigs, with the leaves abruptly pointed, and cones that remain upon the tree.

The Hemlock (Tsuga Canadensis).

Only one species in the northern States, distinguished by flat leaves with short petioles.

The Balsam Fir (Abies balsamea).

Easily recognized by the erect cones and the rounded or notched tips of the rather large, flattened leaves.

The Bald Cypress (Taxodium distichum).

This tree has not before been mentioned in this article, as it is a southern species, ranging north to Delaware. The scales of the small cones are arranged spirally and the leaves are deciduous.

The Arbor Vitæ (Thuja occidentalis).

Easily recognized by the flattened appearance of the branches, and the small cones with opposite scales.

The Southern White Cedar (Chamæcyparis thyoides).

Known by the small, scaly leaves and the globose cones with peltate scales, each scale having a projecting tooth on the middle. Ranging as far north as Massachusetts.

The Junipers (Juniperus).

The junipers are readily known by their fleshy, berry-like fruits, which are cones modified through the thickening of the scales. The leaves vary much in size in the different species. Many leading botanists now separate the common juniper into two species, juniper and low juniper, according to its tree-like or spreading habit.

Juniper (Juniperus communis). — A tree-like shrub or

small tree, having awl-shaped leaves nearly ½ inch long, arranged in whorls of three. Fruit a berry-like cone, dark blue, with a glaucous bloom when ripe.

Low Juniper (Juniperus nana). — A low, spreading shrub, very abundant in rocky fields in many regions, with awl-shaped leaves arranged in whorls of three, and berry-like fruits; dark blue, with a glaucous bloom when ripe. Called also ground cedar.

Red Cedar (Juniperus Virginiana). — A tree or tree-like shrub with two kinds of leaves, partly small and scale-like and partly longer and awl-shaped. Fruit, berry-like, similar to that of the low juniper, borne on short, straight twigs.

Shrubby Red Cedar (Juniperus Sabina).— A shrubby procumbent form, similar to the red cedar except that the fruit is on recurved twigs. Found in northern regions, extending southward only to Maine, northern New York, Minnesota and Montana.

The Yew Family (Taxaceæ).

The Yew (Taxus Canadensis). — Characterized by the red, pulpy, resinous fruit partially enclosing the seed, and the linear leaves with short petioles and awl-shaped tips. A low shrub.











